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NOTES OF OBSERVATIONS.

OF

INJURIOUS INSECTS.

REPORT, 1880.

4th Report

LONDON: W. SWAN SONNENSCHN & ALLEN,
15, PATERNOSTER SQUARE.

EDINBURGH: J. MENZIES & CO., HANOVER STREET.

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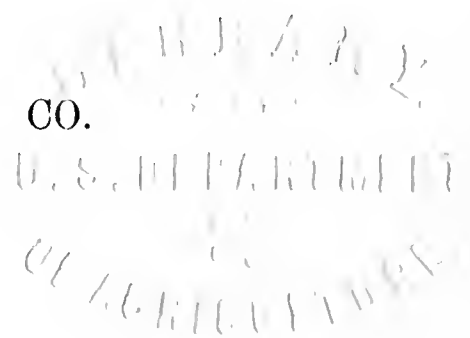
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NOTES OF OBSERVATIONS
OF
INJURIOUS INSECTS.

REPORT, 1880.

THE season of 1880—as shown by observations from the North-East of Ireland, the Isles of Orkney and Mull, and from various localities ranging from the North of Scotland to the South of England—has been remarkably suitable for vegetable growth by its alternations of dry and sunny weather, with storms or periods of rainfall to press on the crops; and from most of the localities where the weather has been thus favourable there are also returns of little amount of insect injury. The great insect attack of the year has been that of the *Tipulæ* larvæ, commonly known as Daddy Longlegs grubs. There has also been severe damage in some localities from the grub of the Carrot Fly and of the Onion Fly; thus showing the chief injuries of the season to have been from larvæ of the Diptera, that is to say of the two-winged flies, which—in the case of the Daddy Longlegs—are known to be most prevalent in wet vegetation and in wet ground, such as was caused generally throughout the country by the continued rains of 1879.

This attack of the *Tipulæ* was not, however, quite universal. It is mentioned by Mr. Service as not occurring to a hurtful extent in the neighbourhood of Dumfries, where he notes there was a winter of fine weather, followed by a cold and dry spring; and the weather report, contributed by Mr. F. Grant Findlay, from meteorological observations taken in the same neighbourhood (at Castlemilk, Lockerbie), shows the same fine state of the weather in detail. Taking the months of January, February, and March, the min. temp. of these (read from exposed thermometer) was respectively 12°, 27°, and 21°; the max. temp. (read from thermometer protected in shade), respectively 48°, 48°, and 59°. The number of days on which rain fell in the same

months was respectively 4, 6, and 6; and the hours of sunshine in each month were 46, 79, and 166.

The minimum of January is thus seen to be somewhat higher than at Kingsnorth, Kent, where Mr. Hart mentions his thermometer as registering several times below 10° , and higher also than at my own station, 68 feet above sea-level near Isleworth, where the min. reading for the month was 11° ; here the days of rainfall in the whole period noticed were more numerous than at Lockerbie, occurring in the above-mentioned months, near Isleworth, respectively on 7, 20, and on 4 days. The temporary changes in the state of the weather were in some cases highly beneficial in clearing away insect attack; in a few instances they were favourable to increase. From various localities we have notes of the rains clearing the Turnip "Fly," and also the beetle, *Gastrophysa polygoni*, when injuring the Mangold crops in Shropshire: the benefit was both from washing down the insects and invigorating the plant-growth. Cabbage Butterflies, which appeared in great numbers on the coast of North Wales, near Llandudno, on the 26th of March, are noted from several places during the summer as occurring with, or immediately following, a duration of dry weather.

The Clouded Yellow Butterfly, *Colias Edusa*, and the Silver Y Moth, *Plusia Gamma*, which appeared respectively in such vast numbers in 1877 and in 1879, were in the first case scarcely represented; in the second but little noticed. The injurious beetles made no great appearance. Amongst injurious Hymenoptera the Gooseberry Sawfly, as usual, appeared almost in every locality where the simple means of prevention were not adopted of removing the surface-soil during the winter from under bushes which had been infested in the previous season. Wasps also have been an almost universal annoyance, reaching its height apparently near Dumfries, and the not distant locality of Glenarm, Antrim, in each of which places both ground and tree nests abounded to an extent that in the first made walking in the copses a matter of some risk from the number of nests suspended from the boughs, and in the second locality prevented the meadows being properly worked. Details of the species and numbers of nests observed are given, which space does not allow me here to insert. Other kinds of Hymenoptera, such as Gall Flies, and insects generally allied to the Wasps and Bees, do not appear to have been largely represented, unless by Humble Bees (*Bombi*) in some localities.

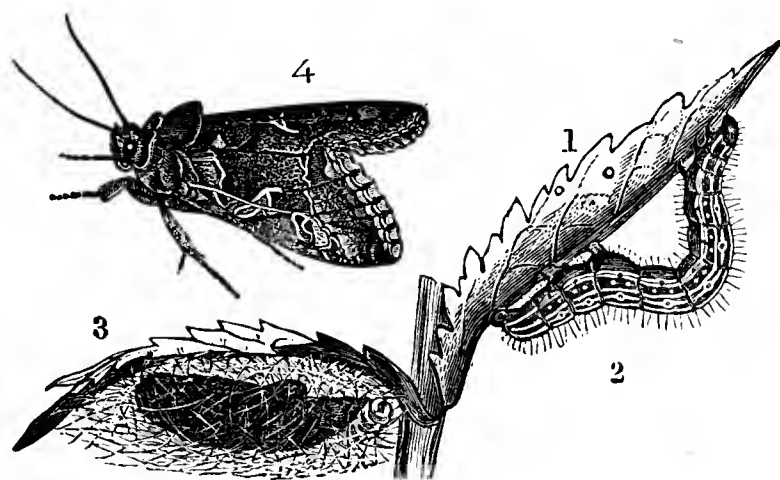
On the whole the weather appears to have been favourable to vegetation, and coincidently with this the amount of insect injury, with the exceptions noted, has been moderate.

I have to express great obligation to the many contributors who

have this year favoured me with notes of methods of cultivation found successful for prevention of insect injury; and, on my own side, I must add that as space does not allow of the notes being in all cases inserted at full length, I trust that the form they are given in may meet with the approval of those who are good enough to entrust me with their observations. With regard to the arrangement I endeavour to classify the notes in order, showing (as may appear best in the case of each insect observed), the general amount of presence or absence; methods of cultivation found serviceable for prevention; chemical or other applications found to be useful or clearly proved to be useless on careful trial; or where no other arrangement appears more desirable the notes of observation are placed in geographical order.

I have great pleasure in being allowed to mention that many of the present contributors, and many others also well qualified to give sound practical information on the subject of prevention of injury by insect ravages to our food crops, forestry, and fruit, have kindly promised contribution of their notes in the coming season.

Before proceeding to this year's observations, I have also to offer my acknowledgments to Messrs. Blackie & Son, Glasgow, for the reproductions from the beautiful figures given in Curtis's 'Farm Insects,' many of which, by their kind permission, are introduced in the present Report; and also to the Editors of the 'Gardeners' Chronicle' for the continued use of the figures, by J. Curtis and Prof. Westwood, with which they have hitherto obliged me.

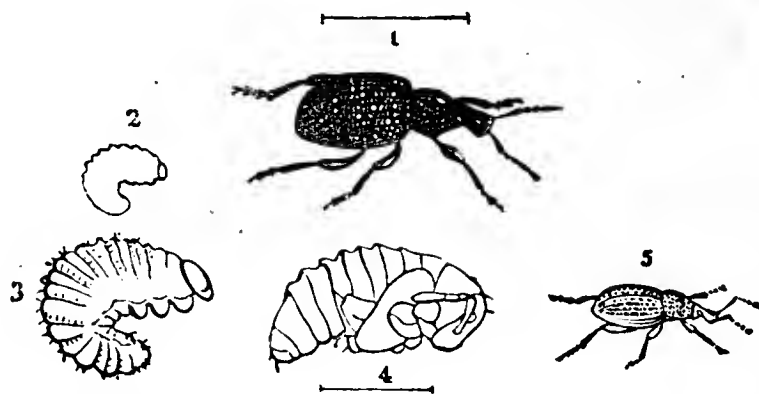


PLUSIA GAMMA.

1. *Plusia Gamma*. Silver Y Moth.

This Moth, which was the great insect appearance of 1879, has been merely noticed in small numbers and in few localities during 1880. Mr. Edward Parfitt observes that up to the 17th of September not a single specimen had been seen in the neighbourhood of Exeter. At New Malden, Surrey, and at Kingsnorth, Kent, it is noticed as scarce this season. At Maldon, Essex, Mr. Fitch notes the Moth as

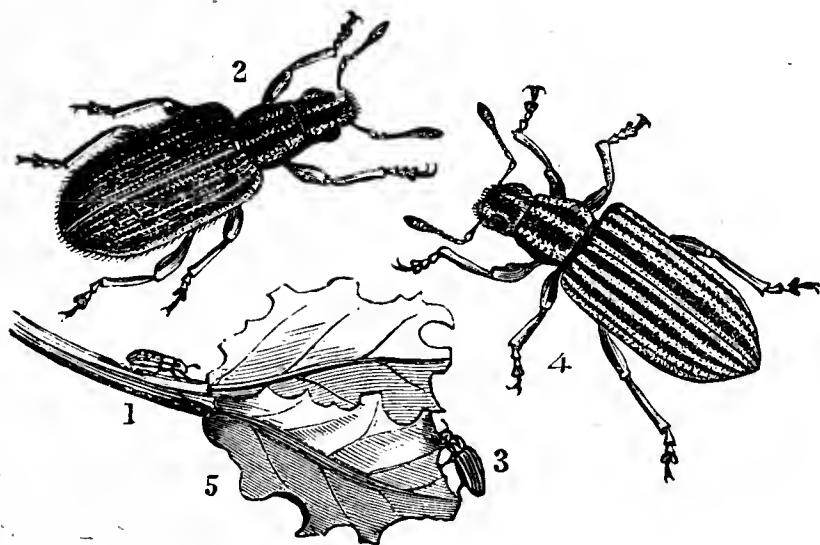
much rarer than usual, and that he had not observed a single Caterpillar. At Sparham, near Norwich, three specimens of the Moth, faded or injured (as if hybernated imago of the year before), which were seen during the summer, and four or five fresh ones captured in the middle of September, were all that were noticed. Mr. Malcolm Dunn notices that it is seldom troublesome in the district of Dalkeith; a few were seen hovering about Lettuce and Peas in August when the weather was dry and warm, but they did no serious injury. Mr. Dunn notes that when the Caterpillars are seen, a dusting of caustic lime, soot, or salt, is a good remedy, and hand-picking a sure but very troublesome one. Mr. Anderson also mentions that a few were seen near Oxenford Castle, Dalkeith, in the spring, but scarcely any in the autumn; it is noticed as moderately abundant at Craighall, Perthshire, by Mr. Robert Coupar.



OTIORHYNCHUS (sp. SULCATUS and PICIPES).

2. Otiorhynchus sulcatus. Black Weevil. This was not common during the past season at Dalkeith, the worst attack being on the roots of some Vines in the neighbourhood, which they severely injured by gnawing and eating them. Mr. Dunn notes that the best remedy is to clear out the soil of the Vine border, and replace it with clean fresh soil. Watering with strong solution of ammoniacal liquor and common agricultural salt is effective in preventing their increase. Mr. Russell mentions that this Beetle is usually very numerous and destructive at Poltalloch, Lochgilphead, Argyllshire, on Peaches and Vines, but few were seen this season. Hand-picking by lamplight is found here to be the best remedy for the Beetle. These Weevils did not reappear in Mr. D'Urban's garden at Exeter, where in 1879 they were thoroughly cleared from the Raspberries by the use of a sweeping-net. Mr. Lyddon mentions them as rather scarce round Warminster, and also notes their power of endurance of cold, and in my own garden (where hitherto they had not been observed) I found some larvæ, which I conjecture to be descended from the specimens experimented on with regard to endurance of temperature, reading as low as $11^{\circ} 8'$ in the previous winter. These were doing damage to

some choice Primrose roots, and to check the attack I dug up the plants at once with the earth attached, and dropped them to the bottom of a small cask of water. Here they remained for upwards of a day and a night; the roots were thoroughly cleared, and the plants did not seem the worse for the immersion. The holes caused by their removal were filled in with gas lime, and the attack appears to have been checked. Mr. Scowcroft mentions soot as a decided protection from the Weevils as long as the disagreeable odour lasts. Mr. Mosley, Huddersfield, reports that he has found the plan of putting tarred boards and shaking the Beetles down on them at night greatly reduces their numbers.

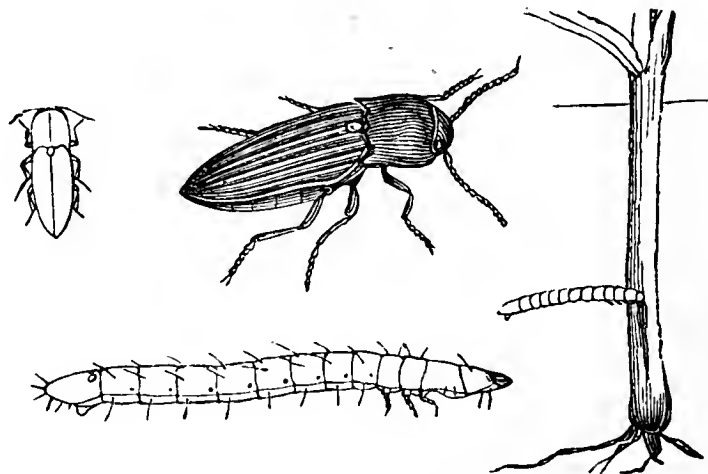


SITONES.

1. *S. crinitus*. 2. Ditto, magnified. 3. *S. lineatus*. 4. Ditto, magnified.

3. *Sitones lineatus*. Pea Weevil: Cuddies. Mr. Fitch notices that hybernated specimens were very abundant near Maldon, flying about in the few fine days of early spring after the frosts (31st January, 13th, 22nd, and 26th February, 1st March, &c.), but later in the year they were far less common than usual, and the Beans, Peas, and Clover were hardly attacked at all, and certainly not to any injurious extent. At Maxwelltown, Dumfries; Sedbury Park, and Little Faringdon, Gloucestershire, they are noted as not numerous, or as less plentiful than in former years. Mr. Long mentions the Pea Weevils have not been as numerous at Henlow, Biggleswade, as in some previous years, when he has had as much as sixteen acres spoiled by them. He notes the difficulty of dealing with the attack, as "in the dry state of the soil at the time—the only time when this pest does much harm"—pressure of the ground such as might diminish the sheltering spots of the Weevil would hurt the plants, and any dressing thrown on the leaves to prevent attack would not hold. Mr. Long adds he now diminishes his risk by the smaller breadth sown. At Kingsnorth, Kent, no perceptible amount of damage was done, but it is mentioned by Mr Hart that, at the time

of Pea carrying, the Weevils were so abundant that the waggon were fairly alive with them. Mr. Loney mentions that at Marchmont, Berwickshire, about the 7th of May, his third sowing of Peas was so badly attacked that, although top-dressed with quick-lime and watered with gas-water, this had no effect in stopping the ravages, and the crop was soon destroyed. The next sowing that vegetated, about the 20th of May, was clear of the Weevil. The Pea Weevil did comparatively little damage in the district of Dalkeith. It is noted that a dressing of lime or soot given to the Peas, after wetting them to make it stick, is an easily applied and generally effective means of preventing attack. At Langwell, Caithness, Mr. Sutherland uses turf or wood ashes in sowing, and is not much troubled by the Pea Weevil. The turf is broken small, and a little is put in the drills; the Peas are then sown, and a little more is placed over them. The ashes, which are from trimmings of dry vegetables, weeds, &c., are used similarly. Mr. Sutherland notes the importance of new seed, and also of a fresh sweet soil. In my garden near Isleworth, where the soil is a stiff loam, I have had success from sowing the Peas in the drills completely in coal ashes. They are thus in favourable circumstances for healthy germination, and there is no risk of soil being caked hard, so as to keep down the first shoot; the growth is vigorous and hearty, and soon puts the plant beyond the power of any common Weevil attack.

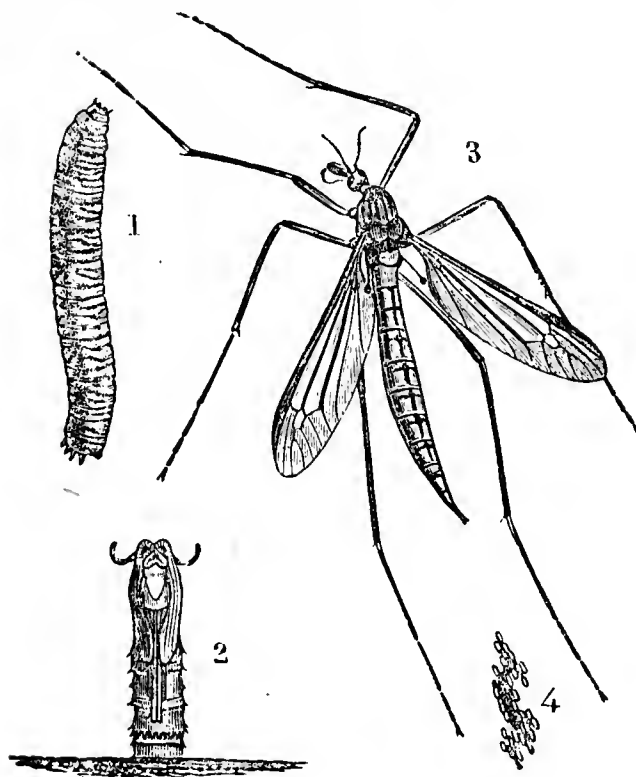


AGRIOTES LINEATUS.

4. *Agriotes lineatus*. Wireworm. Mr. Fitch mentions the Wireworms as far rarer and less destructive than usual this season in the neighbourhood of Maldon. Mr. Lyddon also notes them as not observable on the chalk and greensand round Warminster, Wilts, and ascribes their absence to good cultivation. They are mentioned by Mr. Coupar as very numerous in grass fields near Craighall, Perthshire. Mr. Loney mentions that the Wireworm was formerly very destructive at the gardens, Marchmont, Berwickshire, but now, following on the practice of deep trenching, he is little troubled by it;

and Mr. J. Russell also mentions the Wireworm as not as numerous as usual at Poltalloch, Argyllshire. In many places, however, they have been injurious, and in garden treatment the remedy of trapping in pieces of Carrot or Potato has been found to succeed well. Mr. R. Service mentions that at Maxwelltown, Dumfries, the Wireworms are so numerous that some garden flowers can scarcely be grown owing to their ravages, and he mentions that pieces of cut Potato buried as traps, and examined every morning, are very effective means of destruction. Mr. Malcolm Dunn mentions the most simple and generally successful remedy being pieces of Carrots or Potatoes fixed on the end of a short stick, and inserted in the ground where the insects abound. Examined daily, the insects are found sticking to them, and are picked off and destroyed, the traps being again inserted in the soil, and renewed till the Wireworms are all caught or disappear. In fields where Wireworm abounds, dressing with pulverised gas lime, or a good rolling with a heavy "Crosskill" roller, is effective in checking their attacks. Mr. Boyd, writing from the gardens, Callendar Park, Falkirk, where the *Agriotes lineatus* has been numerous, observes: "I commenced at once with Carrots and Potatoes inserted in the border two feet apart, and six inches deep; I gathered the insects every other day, getting large quantities at first, and continued all summer, and now at the present date there are very few left." This was early in October; at the beginning of the operations as many as twenty-seven were to be found at the root of one plant. Mr. McKinlay mentions that 400 to 500 a day of these Wireworms which were infesting a Vine border near Edinburgh were taken by means of Potatoes and Carrots laid for them. Mr. James Kay, writing from the Bute estates, Rothesay, gives an account of a method found successful in stopping attack of Wireworms on a field of Turnips. In 1876 four acres of orchard ground which had been laid down four years previously in grass was trenched, manured with partly crushed and partly dissolved bones, and sown with Yellow Aberdeen Turnips. The crop looked well until after thinning, when it appeared to come to a complete standstill, and on examination the greater portion was found to be much injured by the Wireworm near to the surface of the ground. As a preventive from complete destruction, Mr. Kay procured a quantity of fine dry sand, and moistened it with just sufficient paraffin for it not to clog, but run freely in the hand. Several women and boys were set to strew this slightly "in spoonfuls" along the centre of the drills, so as to fall directly above the roots of the plants, the whole crop being gone over in one day, and the effect was thoroughly satisfactory. The attack was stopped, and in a few days the plants recovered their vigour, and resulted in a splendid crop. Mr. Long notes that on his land at Henlow, Hertford-

shire, the Wireworm did considerable damage both to Barley and Wheat, so much so as to necessitate re-sowing in the case of one field of Barley. He mentions the only remedy that he is aware of being early pressure of the ground, so as to prevent the Wireworms passing from one plant to another; but in this season (1880), owing to the very dry state of the soil after March, the land would not compress sufficiently for this purpose. The loss on twenty-five acres, estimated rather below than above the mark, was £75. Mr. Hart mentions that he first found the Wireworms troublesome on May 7th, in Wheat and Barley, on his ground at Kingsnorth, Kent. As soon as practicable he put a heavy roller on the Wheat, and trod the Barley with young sheep (tegs); this prevented the "worms" from running; but the weather being cold and dry the plant made no progress, and by the 13th the Wireworm was as busy as ever in the Wheat. Harrowing and rolling were again resorted to, and the worm kept from spreading, but not before it had seriously thinned the plant in patches. One piece of Wheat was so severely eaten that it was ploughed up; after working and pressing the ground well it was re-sown with Oats. But the Wireworm was still there: the attack recommenced, and eventually the Oats also were ploughed up, and the land re-sown with roots. The Barley fared better, "probably from the earth being loose and more easily compressed." Mr. Freestone, writing from the Manor Park, Little Ilford, notices the Wireworms as "less troublesome, in consequence of the largest quantity of Moles we have ever had, being nearly over-run with them, even taking up their abode in the Cucumber frames." Mr. Sym Scott writes that at Ballinacourte, Tipperary, he has not seen any Wireworm; although a field of Oats followed on very old lea, and the farm comprehended a variety of soil and situation, there was no trace of damage. Mr. Scott advocates top-dressing meadows early in autumn, brushing the surface with a moss harrow, or heavy brush-harrow, and rolling as a means of destroying the egg of the Beetle, and consequently the Wireworm. Dr. R. J. Mahoney, of Dromore Castle, Kenmare, Kerry, mentions that he has used salt as a preventive for the Wireworm with considerable success. Mr. J. Kennedy, writing from the Lodge, Lake Cara, on the West of Kerry, mentions the mild climate as very favourable to insect life. Much of the occupation of the neighbourhood is cutting peat; and Mr. Kennedy mentions that the water in the pits drives the Wireworm to the top of the ridges, where they can be rolled. A stone roller is used for this purpose. At Glenarm, Co. Antrim, Mr. Brunton makes no mention of Wireworm attack this season.



TIPULA OLERACEA.

5. *Tipula oleracea*. Daddy Longlegs; Crane Flies.

This Grub has been the most destructive of the Farm pests of 1880. The parent Flies, commonly known as Daddy Longlegs, or Crane Flies, deposit their eggs either amongst damp grass or leafage, on the surface of the ground, or just below the surface, choosing especially such situations as damp meadows, Clover leas, hedge sides, and the like; consequently the season of 1879, when all was damp, suited them admirably; and a few notes in detail of the ravages of the Grubs from last autumn's eggs, and their cost, may help to give some idea of the loss entailed by a wide-spread attack of this kind to the country at large.

The first observation was forwarded during February from Mr. J. Harrison, Wilstrop Hall, near York, who mentioned that the Grubs were destroying hundreds of acres of autumn-sown Wheat on heavy land in the district, doing their work with great rapidity. In one field of twenty acres, that was especially observed, they had destroyed almost every plant within a week or ten days, although seven cwt. of salt had been applied per acre. The pest was only observed there on Wheat sown after clover.

Early in the year, also, Mr. Scowcroft mentioned that at Ormskirk, Lancashire, "the Grubs swarm in almost countless numbers where last year's crop was grass; and a number of farmers are again paying for having them hand-picked." At the Birches Farm, Tenbury, Herefordshire, they were also reported as very destructive in May; 40,000 Cabbages had been planted, and the Grubs were working amongst them. Salt and lime were found useless. Mr. Marshall, writing in

June from Winteringham, North Lincolnshire, reports that on the strong alluvial land, especially that adjoining the Humber, the *Tipula oleracea* Grubs were most destructive amongst Barley, and also present in February-sown Wheat. Many fields were consequently stripped of vegetation; as many as twenty-five Grubs could be counted to the square foot, and in some cases the crops were consequently ploughed up, and the ground planted with Rape and Mustard, to be sheep-fed off in September. Mr. J. Searsby, writing on the 10th of May from Firsley, Spilsby, mentions the Grub as having been eating the Wheat down since February, and that caustic lime and salt were both found useless; soot was of some small benefit by killing a few of the Grubs. Mr. Hart mentions that the Grubs were troublesome throughout the spring at Kingsnorth, Kent, but he does not consider that they had a bad attack on any crop, and hoeing, harrowing and rolling were sufficient to prevent any serious damage. Mr. Charles Foran, writing from Eastbourne, says of the *Tipula oleracea*: "Was not so numerous as last year, when they cleared patches of grass; this I attribute to the Starlings, which fed on the larvæ during the early months."

Mr. Fitch notes as follows regarding the *Tipulæ* on his ground at Maldon, Essex: "*Tipulæ* larvæ were exceedingly destructive everywhere. I had twenty acres of November-sown Peas intended for early podding, which until April looked perhaps the best crop in the neighbourhood. Throughout that month they suffered severely from the attacks of *Tipulæ* larvæ." These larvæ were to be found up to four or five in number at the root of one Pea; they injure the plant by eating away the bark just at the surface of the ground, or rather below it, thus weakening all, and killing many, of those they attack. They were "also very abundant throughout April in Wheat; where a sod or tussock of grass was hoed up or pulled up five or six larvæ were often found under it; here they grow to very large fat chaps, much finer than those in the Peas." In this case the Flies proved to be *Tipula oleracea*. The young Grubs in April and May were like short broken pieces of Earthworm, but somewhat darker in colour. The only remedies that Mr. Fitch considers as applicable are frequent hand or horse hoeing, the former being preferable. This disturbs the working of the Grub, exposes many to birds, animals, &c., and kills some; but it is "a dear remedy against a bad attack," as they lie in the earth so very close to the roots and stems of the plants. Mr. Fitch mentions the loss in his Peas was quite £5 per acre in the crop, besides the expense of frequent hoeings (five at from 4s. to 5s. 6d. per acre); first to combat the Grub attack, afterwards to keep down the weeds, which is always a difficult matter in a thin crop. "My field of twenty acres only realised £110 when picked on June 23rd; whereas in March, before the *Tipulæ* attack, certainly less than £10 per acre could not

have fairly been expected. With regard to subsequent appearance of the Flies Mr. Fitch notices that they were common, but not unusually abundant; and he considers the dry weather of May did much to get rid of them by hardening the heavy land, which to a great extent stops the "travelling" of the Grub, and also rubbish hoed up died, so that the Grubs were fairly starved out.

Mr. S. Fitton, of Cheerbrook, Nantwich, Cheshire, favours me with details of experiments tried by himself, or at his desire, which are of much value in showing the power of the Grub to endure poisonous applications (and consequently the little profit which often ensues on large outlay in these materials), and which also show the benefit arising from application of stimulating manure in such form as washes down at once to the roots, and so helps to carry the plant over the attack. The field observed was a seventeen acre field of Oats, in Clover the preceding year, and the attack commenced before May. On first discovery, the application of a heavy roller was tried, which did no good; afterwards a dressing of salt at the rate of three cwt. per acre was applied throughout the entire field, but also without success. Subsequently a heavy dressing of soot was applied to about three acres; three acres were spread over with rape cake, to the extent of four cwt. the acre; and four acres were dressed with quicklime. After the lapse of a week no difference could be detected in the state of the portions thus treated and the rest of the field to which only salt had been applied. Mr. Fitton then sowed ten acres of the ground with guano and salt mixed at about the rate of four cwt. to the statute acre, and since then Mr. Fitton noted (writing on the 25th of May) he could not perceive any further damage, the repeated applications encouraged the plants, and the field was of a good colour, and for the most part looked well, though on inspection was thin of roots, the amount of plant destroyed being then estimated as follows:—Nine acres, about one third destroyed; five acres, one half ditto; three acres, two-thirds ditto. As the matter then stood, the loss fairly to be estimated to the yield of the coming crop was at "the rate of twenty measures the acre," and to the straw at the rate of ten cwt. the acre; besides the expense of the remedies and the application thereof, which was a good deal; "the field was rolled, harrowed twice over, and about two acres were resown." In this case, however, Mr. Fitton's treatment in the use of stimulators brought the crop through beyond hope. By the 1st of July the greater part of the field was in hearty growth, averaging three feet high and of a rich colour; and on the 27th of September the report of the field was that (with the exception of one acre that had been almost destroyed before any remedy was attempted) there was a very heavy crop. The stack from the field measured thirty-four yards long by five yards wide and four

yards high. This return shows many important points ; we have the destruction of the crop on one acre where the Grub attack was not attended to ; also a trustworthy estimate of the amount of loss to be expected on shortness of crop following attack, and outlay thereon ; and we have the thorough recovery based not on chemical or special applications to destroy the Grub, but on the broad principle of supplying extra food to support the plant, and keep it up in heart, whilst suffering (*i. e.*, starving) from more or less of its food supplies being cut off according to the greater or less amount of the stem gnawed by the Grubs. With regard to special experiments made at Mr. Fitton's desire by Mr. A. Smetham, of Liverpool, to ascertain the effect of various chemical applications on these Grubs, he mentions that it was found that a four per cent. solution of carbolic acid in water killed them in one to two minutes, and that in a solution of one part of carbolic acid to 250 of water they were killed in eight minutes. Blue vitriol killed them in about ten minutes ; green vitriol in less time ; caustic potash and also lime did not seem to affect them much. The strong solution of carbolic acid was experimented with in the field, but it proved useless practically, as on examination the Grubs were found within one inch of the surface of the ground watered with it. In my own experiments with regard to the effects of immersion in pure water, I found that although the Grubs appeared to be dead after remaining immersed for about fifty-eight hours, yet they recovered when they had been for about ten hours exposed to the air ; the amount of further endurance of immersion was difficult to ascertain precisely, but the whole period did not exceed about five days and nights, as the Grubs then burst. Immersion in nitrate of soda caused an immediate and violent discharge from the intestines. With regard to the effect of cold, I was kindly permitted to have some specimens frozen at Kew Observatory by artificial means down to a temperature of -10° ,—that is to 10° below zero, or 42° of frost, and though almost all the Grubs died under the experiment, yet it showed that exceptionally the Grub could survive even this amount of cold, to all appearance uninjured. Mr. George Brown, jun., Caithness, also mentions instances being known of the "Grub" being frozen until quite brittle, and yet when thawed being as lively as ever.

With regard to salt, Mr. George Brown mentions that he planted a number of Cabbages (all in a thriving state before the Grubs were introduced to them) in flower-pots. Salt was then applied upon three occasions, being increased in quantity until plant-life was destroyed, and on examination the Grub was found at increased depths in the soil, this depth below the surface seeming to be regulated by the amount of salt applied, but all the Grubs were found to be in no way the worse for the application. Mr. Robert Service mentions that he

has placed the "Grubs" in a strong brine for twenty-four hours, and that it has not killed them. Shortness of food also does not affect the Grubs rapidly, as Mr. Fitton mentions that he placed some of them in a glass globe with a little soil, but no plant-food, and three weeks after they appeared all right. The thing that the Grubs really cannot bear (as far as the experiments noted show for practical purposes) is drought. Of the large number sent me by post, I could rarely find enough alive for the experiments I wished to undertake, and I ascribe their condition to want of moist surroundings. Mr. Robert Service mentions that at Maxwelltown this "Leather Coat Grub" is as a rule the most damaging pest of the neighbourhood, but that this year, in which a dry cold spring followed in that locality on a fine winter, he did not see a field either of Grass or Corn affected to any extent.

Mr. Loney, writing from Marchmont, Berwickshire, not far distant in geographical position from that of the above observation, also notes only a slight attack. A few patches of Oats were attacked during May, especially on soil that was not in a good state of cultivation, and he strongly advises deep winter ploughing as a preventive against the Grub. This is noticed by Mr. Malcolm Dunn as being less destructive than usual at Dalkeith during the past season. The same traps as are used for the Wireworm are also effective in catching the Grub of the "Daddy Longlegs." When the Cabbage tribe are planted in ground infested by the Grub, they should have their roots and stems up to the leaves well smeared in a thick mixture of clay, nightsoil, and ammoniacal liquor (from gasworks), or some other equally nauseous compound, which the Grub does not care to attack. The stem of the plants is the part usually attacked just under the surface of the ground, and it is a good plan when the Grub is observed to be active to draw back the soil around the stem to a depth of a couple of inches, and put a ring of lime, soot, or even rotten manure round the stem of each plant, which will generally prevent the Grub attacking it. Mr. Dunn notes that the Spotted Crane Fly, *Tipula maculosa*, was scarcely seen, and not any serious damage done by it. The same appliances as for the "Daddy Longlegs" Grub are used to destroy it, but it is rather more difficult to kill.

Mr. Anderson mentions that the Grubs were found to be very destructive amongst Strawberries at Oxenford Castle, Dalkeith, as many as from seven to twelve being found at the root of one plant just beneath the surface. Hand-picking was the only remedy resorted to, which, as Mr. Anderson justly remarks, "is both expensive and repulsive." Mr. Whitton mentions that at Coltness, Lanarkshire, there was a strong attack of *Tipula oleracea*, locally known as "the Grub;" he notes that he never saw anything like it before for quantity, but that the damage done was not as great as might have

been expected. These Grubs were noticed in moving Sedums in the garden, and as many as possible were killed with the spades; the beds were left for a day or two, and then forked over lightly again. This disturbance caused the Grubs to move on to the walks (which are made of asphalt) at the same time the lawns were being rolled, and in the morning the Grubs were on the walks by hundreds. All trouble in destroying them was saved by starlings and tame ducks from a small pond in the grounds, and the lawns were thus saved. In the kitchen garden the Grubs did much harm both to the Strawberry plants and to the Cabbages. Mr. Whitton mentions that he tried carbolic acid and ammoniacal liquor from the gasworks, and hopes to succeed in future by applying them at night when the Grubs are on the surface, and it might be expected to kill them as it did those on a hard walk. Mr. Whitton also notes relatively to the field crops that a sowing of good guano on the first appearance of the Grub, if done in showery weather, is considered a good remedy.

Mr. D. Scott mentions that at Darnaway Castle, Morayshire, a considerable number of Grubs were noticed in a crop, partly Potatoes partly Oats, following on old lea, but that no perceptible injury was caused, and he adds, "I think the rooks must have done good work in the way of destroying them; they were for a time continually in the field, and had apparently turned and returned every clod." Mr. Robert Coupar notices the *Tipula oleracea* as very numerous at Craighall, Perthshire, and that the Fly was to be seen in enormous quantities by the roadsides at night. He mentions the *Tipula maculosa* as not so common. Mr. M'Donald, writing from Balfour Castle, Orkney, says, "Never have we experienced in Orkney a drier, warmer, or sunnier season than this of 1880, but never has the Grub of the *Tipula oleracea* been more destructive." He suggests that the early warmth acted on unhatched eggs, and, together with an early and luxuriant vegetable growth following on the previous ungenial seasons, promoted a rapid development of larvæ, resulting "in such myriads of Daddy Longlegs as I never before saw." In the Isle of Man these Grubs were also troublesome. On the 5th of May Mr. Edwin Birchall forwarded specimens, with a note that these larvæ, locally known as "Cutworms," were ravaging the Oat fields. Salt was not found destructive to them, and Mr. Birchall notes that the chief manure used in the island is seaweed. He also draws attention to the great amount of benefit we have from the lapwings clearing off this pest, and the desirableness of these birds being protected from the wholesale destruction of which he gives notes. Mr. Mosley of Huddersfield, draws attention to the large number of Crane Flies, which from personal observation of rooks in some badly infested Grass fields he found were rapidly cleared by these birds.

6. *Anthomyia ceparum*. Onion Maggot.

Mr. Melville observes, writing from Dunrobin, Sutherlandshire, that this year's experience has much strengthened his opinions as to the best way to avoid attack of this Fly. (See Report for 1879, p. 12.)

Mr. Alexander Forbes mentions that an excellent crop of Onions entirely free from Maggot was harvested at Skibo Castle, Sutherlandshire; and Mr. Fitch did not observe any attack at Maldon, Essex; but in many localities the Maggot was very destructive. The most successful remedy for the attack, when found to be established, appears to be in the use of paraffin oil; and I place consecutively the descriptions of treatment that include methods of application of this cure.

Mr. M'Kinlay, writing from Tulloch Castle, Ross-shire, mentions that in many parts of Ross-shire the Onion crop suffered much from the Maggot, and in some gardens it was a complete failure, the summer being dry and apparently suitable to the Onion Fly. The only means found serviceable for prevention was the use of sand saturated with paraffin oil, and sown amongst the Onions, and this afterwards watered by means of a can with a rose. Mr. M'Kinlay experimented on the direct effect of the paraffin by placing some Onion Maggots in a flower-pot in soil with some young Onions. On the third day (thus giving time for the Onions and their contents to be re-established) he introduced three drops of paraffin into the flower-pot; and on examination with a magnifying-glass, twenty-four hours afterwards, all the Maggots, with the exception of two, were dead. Lime water was not so effectual, but proved fatal after a time. In the gardens at Tulloch Castle the crop was excellent. The method of cultivation is to trench the Onion ground early in autumn, working in plenty of manure, and leaving the surface rough to be pulverised by frost. About the 10th of March, if the weather is favourable, about six or seven cart-loads of hen-manure are wheeled on to the Onion break previous to forking (care is taken to have the hen-manure well turned during the winter, and covered with soil to keep in the ammonia). After forking, the ground is well raked, the seed sown in rows a foot apart, and after it is covered the soil is well trodden with the feet and raked over. The trampling of the feet makes it quite hard, and is considered to do good by preventing progress of the Maggot.* Mr. Wilkie mentions the Onion Maggot as having done considerable damage at Ardkinglas, Argyllshire; but that after mixing a good glassful of paraffin oil with about six gallons of water

* The power of the Maggot to travel from one bulb to another deserves more consideration than is usually given to it. This point is not mentioned, as far as I am aware, in the life-histories; but from my own observations I believe the Onion Grub has full power if food runs short in one spot to remove to a neighbouring bulb.—ED.

and carefully throwing a spray of the mixture over the Onion bed two or three times, the attack was terminated. At Langwell, Caithness, Mr. Sutherland notes that the ground is ridged for the Onions so as to expose it as much as possible to the frost; and horse manure is thought to be the best (if not too much fermented) for use on heavy damp soils. Here the Maggot was very troublesome this season, and when it appears paraffin is mixed with water in the proportion of a pint (English measure) to two gallons of water, and with this the Onions that are planted in rows are watered through the spout of the can without the rose; those that are in beds are watered with the rose on the can. Mr. Sutherland observes that the paraffin should be used carefully in dry weather, lest it should burn the plants.

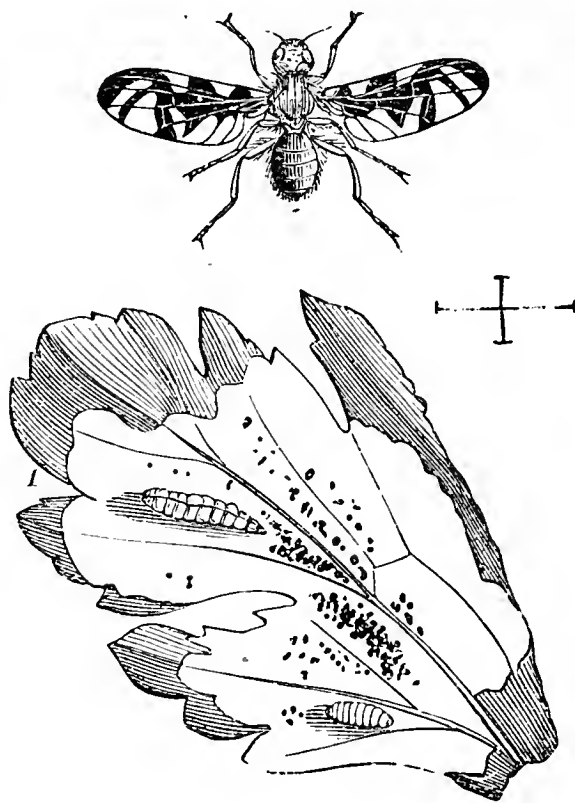
Mr. Simpson mentions that the principal part of the Onion crop at Brahan Castle, Dingwall, was not injured; but a few lines of Welsh Onions, sown in a part of the same break, were spoiled by the Maggot, conjecturally in consequence of the different treatment of this part of the ground. The ground for the principal part of the crop was trenched and manured at the end of the previous year, and soot and wood ashes were spread on the surface before levelling for seed-sowing on the 11th of March. Mr. Boyd observes that he noticed many of the Onions in the gardens at Callander Park, Falkirkshire, at the beginning of May to be turning yellow at the tips of the leaves, and on pulling them up found nothing but a tube full of Maggots. He at once put on a woman to pick every Onion so affected and burn them; and the result was as fine a crop of Onions as could be desired. Mr. F. Grant Findlay mentions that at Castlemilk, Locherbie, Dumfriesshire, the damage from Onion Maggot is usually trifling; this year, however, it amounted to fully one-eighth of the crop. Mr. Findlay finds its presence less observable when the ground is well prepared previous to sowing the seed. He generally trenches deep in November, and lays in a liberal supply of well-decayed stable and cow manure; and the natural soil being stiff and heavy is greatly improved by exposure to the air; therefore it is put up in ridges, which remain until the latter end of February, when they are levelled with forks. On the first favourable day in March the ground is well trodden, the seed is sown in drills, and before the drills are closed a compost is sown broadcast and pretty thickly over the ground, formed as follows:—four parts of refuse soil from the potting bench, two parts dry soot, and two parts wood ashes; these are thoroughly mixed together and put through a fine sieve before being used. This system usually produces good crops of excellent quality, and with little amount of insect attack.

At Torloisk, in the Isle of Mull, Mr. Grierson notes that the Onion Maggot began its attack about the 1st of June, and by the end of July

there was not a single Onion on the break of about eighty square yards. The ground had been rather wet, so it had been drained in winter and trenched about two feet deep, and a good layer of farmyard manure placed at the bottom of the trench. In the spring, a few days before sowing, a compost was made of soot, sea sand, pigeon manure, and lime rubbish; a good coating of this was given all over the land, and it was forked in. Several dustings with soot were given when the Onions were above ground, but the whole crop, nevertheless, was lost. The Maggot is also reported by Mr. Russell as having been very destructive at Poltalloch, Lochgilphead, Argyllshire. Mr. Russell considers that in the light soil of that neighbourhood the Onions do best on ground not trenched, and he gives two dressings of guano—one when the plants are about four inches high, one later on. The Onion Maggot is noticed by Mr. Whitton as worse this year than usual at Coltness, Lanarkshire. The beds were dressed at the time of sowing with Annis's chemical manure as a preventive; on the first appearance of the Grub another dressing was given, but it failed on this occasion, though previously it had been found of use in checking the Maggot. Mr. Robert Coupar, writing from Craighall, Perthshire, mentions the Onions throughout that part of the country as being everywhere more or less damaged, and the Onion crop almost a failure.

Mr. M'Laren notes that at Hopetoun, South Queensferry, he has found a solution of alum in water a good and cheap remedy for the "Worm" in Onions. The Onion Fly was not so plentiful as usual in the district of Dalkeith, the past season being good for the Onion crop. Mr. Malcolm Dunn mentions—"Autumn manuring with rich and well-made manure, deep cultivation, and change of ground every season, secure us first-rate crops, almost entirely free from 'Maggot.' The soil is put up in ridges when trenched, or double dug in autumn, the ridges levelled with forks early in March, the surface firmly trodden, raked, and drilled about a foot apart, and the seed sown. When the plants are about six inches high, they are thinned from three to five inches apart, according to the size they grow, and receive a dressing of dry soot on a damp morning. Keeping clean of weeds is all that they require afterwards till the crop is ready for lifting." Mr. P. Loney, writing from Marchmont, Berwickshire, mentions that he has no trouble with the Maggot, as "on its first appearance I water freely with soap-suds two or three times, which usually destroys it, and nourishes the Onions." In some localities the crop was entirely swept away, or was much injured. Mr. Robert Service, writing from Dumfries, mentions the attack of Maggot "never was worse than it was in this district during July; I do not think there was a single bed of Onions unaffected by it." At Sparham, near

Norwich, and at Little Ilford, Essex, the Onions suffered much from the Maggot, and the Onion bed in my own garden near Isleworth was the most complete failure I ever met with. I attribute this in part to the ground, which is a stiff loam, not being sufficiently cultivated and manured beforehand; also, I feel doubts as to the desirableness of guano as a stimulant. Being anxious to experiment on the matter, I applied it liberally as a watering, or occasionally as a dry sprinkling along the rows, washed in by watering; and following on this the attack commenced, and was excessively severe.

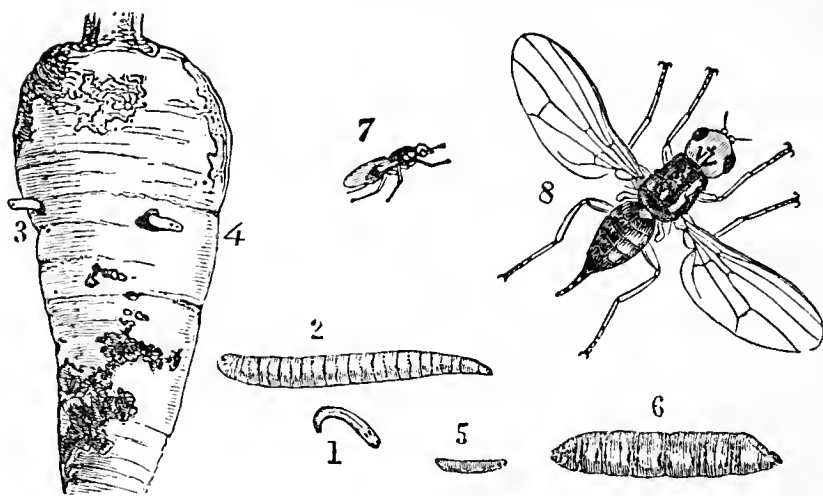


TEPHRITIS ONOPORDINIS.

8. *Tephritis Onopordinis*. Celery Fly. The worst attack observed of this Fly was reported by Mr. Glenny, who forwarded specimens of injured leaves from Barking, Essex, on the 16th of September. On the first signs of insect presence the infested portions had been picked off, and it was hoped further damage had been prevented, but about the beginning of September a new attack took place, and the Celery was spoilt for the year. At New Malden, Surrey, Mr. J. Dobson, jun., notes that the larvæ were very plentiful in the same situation as last season, and that pinching the Grubs in the leaves, which was then tried, proved of little use as a remedy. This year he had each plant examined when transplanting, and all pieces infested by Maggot snipped out with a pair of scissors. Another examination was made three weeks later, accompanied by a similar trimming, and the Celery growth was pressed on by good treatment. The result was "a better crop could not be wished for." In my garden near Isleworth (in which neighbourhood the Celery

often suffers very severely), I had the trenches prepared with plenty of rich manure from a butcher's yard, and covered over with earth about three weeks before the plants were moved to them. I allowed the young plants, which had been pricked into a bed in the usual way, to grow rather larger than is customary before moving, and then had each one taken up by the trowel, and moved with as little disturbance as possible; thus they did not flag at all, and no attack followed the removal. To keep off the Fly, I used a dressing of one part of gas-lime (about a month from the works), one of unslaked lime, and two of mixed dry earth and soot, all well stirred together, and dusted liberally on the plants, so as to lie on the leafage and lightly cover the ground. This did not injure the leafage in the slightest perceptible degree, and beyond a few stray injuries I had no attack from the Celery Fly. Looking at the point of Celery being a plant naturally growing in wet spots, I occasionally had the hose turned on one of the trenches, so as to soak the ground thoroughly, and the effect was excellent on the growth. Also by this means the leaves may be well cleared of insect vermin. If the hose is directed at the foliage when a good power is on from the water-works, and taken steadily on from one end of the row to the other, the stream will be preceded by a gradually increasing collection of small Flies driven from the plants, which thus are freed from some amount of attack, and are cleared of the insect vermin at least for a while.

Mr. Freestone notes that the Celery at the Manor Park, Little Ilford, Essex, was very promising until early in August, when the Maggot destroyed the whole of the foliage; a worse attack than had been observed in ten years' experience. A similarly severe attack of the same species of insect (the *Tephritis Onopordinis*, or Celery and Parsnip Leaf-miner), occurred at the same time to the Parsnip crop, nearly all the foliage being destroyed. The six weeks' drought in July and August is noted as apparently favourable to these pests. The Celery is reported as unusually free from the Maggot. Little is noted concerning it from northernly localities. Mr. Simpson notes from Brahan Castle, Dingwall, that it is "never seen in this quarter." Mr. Loney also mentions it as never observed at Marchmont, Berwickshire; and Mr. A. Shearer notices the Celery as not being much attacked at Yester, East Lothian. A rather sharp attack is mentioned by Mr. Malcolm Dunn as observed at Dalkeith about the middle of August, the Maggot appearing at the same time in the leaves of both Celery and Parsnips; however, it made little progress, and soon disappeared. The usual remedy is noted to be hand-picking, as soon as the spots with the Maggot are noticed on the leaves.



PSILA ROSÆ.

Carrot Fly, larva and pupa natural size and magnified.

9. Psila Rosæ. Carrot Fly. The following observations give details of methods of treatment found most successful in pushing on healthy growth, with notes of the use of special applications, as wood-ashes, soot, gas-lime, soap-suds, &c., and also of the use of paraffin; attention is also drawn to the importance of keeping up an unchecked growth, and especially of the danger of attack from the Fly penetrating down into the ground to lay its eggs in the Carrots when disturbed by thinning. I endeavour to give the observations in such order as may place the notes referring to any special applications or methods of treatment together, and the first include details of application of paraffin. Mr. Alexander Anderson mentions that he has grown the early French Horn Carrot for the last four years at Oxenford Castle, Dalkeith, on a bed of tree-leaves covered with soil composed of the emptyings of flower-pots, boxes, &c., and consequently of a light friable texture. The size of the bed is fifty feet square, which is subdivided into four feet beds, and is sown broadcast. The crops have proved clean and good, with the exception of last year (1879), when they were an entire failure. On the 19th of April in this year, 1880, Mr. Anderson had the soil dug over, and the ground again sown with Carrot seed, and in order to experiment, after the seed was sown, the beds were beaten quite firm, and lightly covered with soil as above-mentioned. A good dressing was then given with wood-ashes, in which paraffin oil had been mixed in the proportion of one quart to a barrow load of ashes—about one cwt. When the plants were about four inches high, a second dressing of the same mixture was given, and Mr. Anderson says he can state that he never lifted a better crop of Carrots. In other parts of the garden, where they were dressed with wood-ashes alone, the Carrots were badly affected. Mr. Anderson mentions that he thinks that mixing the paraffin with some absorbing substance is better than simply watering with a solution of it, as it lasts longer,

and is more gradually carried down into the soil. He mentions also that he never thins the Carrots until they are fit for use, as unless it is done very early there is great danger of leaving broken roots in the ground, and thereby encouraging the Grub.

Mr. M'Laren notes that the Carrot crop in the garden at Hopetoun, South Queensferry, was lost for several years until paraffin oil, in the proportion of two wine glasses to a gallon of water, was run along the drill as soon as the Carrots were thinned. This proved very successful, but Mr. M'Laren considers that a solution of alum in water applied by a watering-can with a rose is still more effectual, and also saves some risk of misapplication of the paraffin. Gas-lime is also mentioned as a cure for the Carrot Worm, dug two or three inches deep into the bed before sowing. Mr. Malcolm Dunn, writing from Dalkeith, notes the Carrot Fly as "an annual pest in this district, but scarcely so bad as usual during the past season." Remedies have been given in former reports. Perhaps the most effective is a dressing of gas-lime forked into the soil before sowing, or an application of ammoniacal liquor or strong manure water whenever the Fly is first noticed on the wing. Mr. Alexander Forbes, of Skibo, mentions that in an experience of twenty years he has found more difficulty in securing good clean Carrots than any other crop, and that though he is seldom free from the Fly entirely, yet he has never had a complete failure since adopting the following course:—Before hard frost sets in he has ground double dug, putting manure at the bottom of the trench, and when this is complete gives a good dressing of salt, which is washed down before spring, and previous to sowing a good dressing of soot and wood-ashes is forked into the soil. He is careful to perform the first thinning as soon as the plants can be handled, leaving them an inch or two apart. When the thinning is finished he gives a sprinkling of guano, and if dry a thorough watering, and he particularly draws attention to the great importance of running on a healthy growth. He observes, "We hold it of the utmost importance to keep them growing without a check till some time after they are finally thinned, when, if all has gone well, the crop may be considered secure, but it will be well, however, to look them over occasionally, and if any be found to droop, they had better be pulled up and burned."

Mr. Grierson's treatment of his Carrots at Torloisk was quite successful. The ground (as with that for Onions) was drained in the previous winter, trenched about two feet deep, and a good layer of farm manure placed in the bottom of the trench. In the spring the ground was prepared in the usual way, but before sowing the seed Mr. Grierson had deep holes made about eight inches apart, and filled with a compost of old soil from the potting shed, soot, sea sand, wood-

ashes, pigeon manure, and lime rubbish; and a few seeds were placed in each hole. The result was a splendid crop of beautiful clean Carrots. A few lines were tried without the holes, and with a little of the compost placed beneath the seeds, but every one was destroyed by the Carrot Grub. Mr. John Sutherland notes that at Langwell, Berridale, the ground is turned as rough as it can be laid in winter, and a good dressing of salt is given. In spring it is forked over with a steel grape, and a dressing given of peat and ashes, and the lines sown a foot apart. When the Carrots are thinned, a mixture of soot and water is poured on them, and paraffin is also used as a watering. One English pint of paraffin to two gallons of water is the proportion which Mr. Sutherland has found serviceable in garden watering, with care in application, especially in dry hot weather, lest the paraffin should burn the plants. Mr. Melville, writing from Dunrobin, Sutherlandshire, mentions that he is confirmed in his views of the treatment advised last year (see Report for 1879, pp. 14, 15), in which, with some notes as to preparation of the ground, he particularly recommends that any thinning that is necessary should be done whilst the Carrots are an inch or two high, and in wet weather.

Mr. M'Kinlay notes that at Tulloch Castle, Dingwall, the soil is not suitable for Carrots, being of a damp heavy clay, and it has consequently been found desirable to prepare a special piece of ground where the Carrots are grown year after year. The soil was removed to the depth of two feet, and replaced by a mixture of well-decayed leaf-mould, sand, charcoal, soot, and light soil; this mixture is found to grow Carrots very well. The Carrots on this ground were little attacked by the Fly, though some in the neighbourhood suffered severely. In one locality it was found a good treatment to put short Grass between the rows to prevent the drought going down. Paraffin, as recommended for Onions, is also noticed as useful. It is noted as desirable that Carrots should be thinned at the first weeding to the distance at which they are to be grown in summer; as when Carrots are thinned, after they come to any size, the soil is opened around them, and if dry weather follows the Fly is sure to attack them. Mr. Simpson notices the Carrot Fly as very destructive this year at Brahan Castle, Dingwall. He says "I am in the habit of sowing thin, and not thinning the Carrots till fit for use." This season, after they commenced thinning the second sowing of early Carrots, "the Grub commenced too, and within three weeks spoiled them for use. Late ones alongside escaped until we began to use them, and by keeping to the side the 'Grub' was on it kept up, but did not advance beyond the thinning." Neither lime nor soot had any effect, though dusted over the ground. Mr. F. Grant Findlay, writing from Castle Milk, Lockerbie, mentions that the Fly has been unusually troublesome this

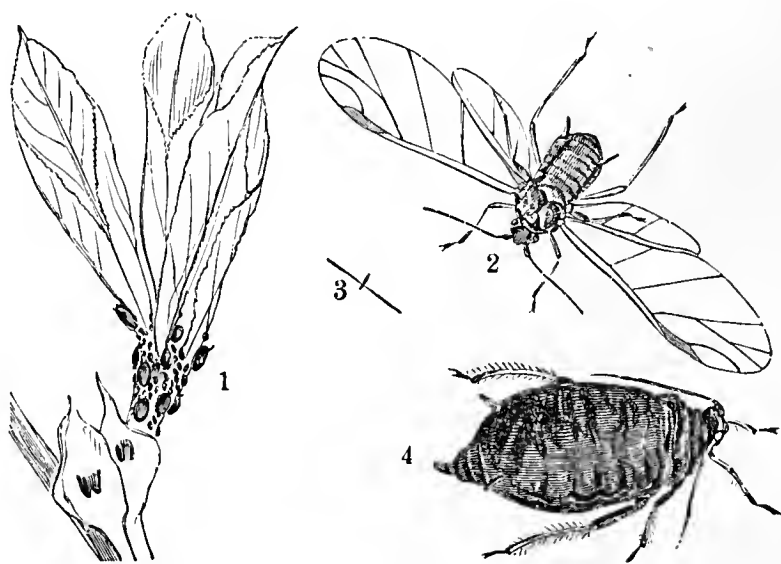
year. He observes that, having hitherto failed to discover any effectual remedy, he determined to try the effect of a change of soil, and accordingly in January had a portion of a break in vegetable cropping ground cleared out to the depth of twenty-two inches. This vacancy was filled in afterwards with a compost of four parts good brown peat, four parts light fine yellow loam from old Vinery border, two parts well-decayed leaf-mould, and two parts river sand, the whole being thoroughly mixed together; no manure of any description was used. The Carrot seeds were thinly sown on the 6th of April in drills fourteen inches apart. They soon germinated, grew rapidly, the thinning was done in the latter part of May, and all went on well until the 17th of June, when the Fly was observed to have begun its ravages, and in less than fourteen days the whole crop was rendered useless. In another part of the garden a hotbed of stable manure was made up, and on the surface of this bed a layer of well-decayed leaf-mould was laid to the depth of ten inches. In it the Carrot seeds were sown on the 13th of February, and an excellent crop was obtained from the beginning of May. Here the Fly did not make its appearance until the 27th of July, the remainder of this crop being destroyed by its ravages by the 12th of August.

Mr. T. Boyd mentions that being troubled with the Carrot Grub at Callendar he customarily sows on two or three pieces of ground. During last winter he gave one piece of ground intended for Carrots a top dressing of gas-lime, and not one carrot on this ground went; whilst on the other piece, to which nothing had been applied, the whole crop went before the last week in April. His method is to rough dig the ground at the beginning of winter, then sprinkle the gas-lime over the ground "till it resembles a fall of snow;" then point it in about four inches. Mr. P. Loney, writing from Marchmont, Berwickshire, observes, "I very seldom have a visit from this Fly:" deep trenching after Celery, cropping with Onions and with Carrots without manure, is the system I adopt; whilst the slightest deviation, especially on land recently manured, is sure to produce them. Mr. Service, writing from Maxwelltown, mentions the crop of Carrots being reported as saved in a cottage garden "by deluging them with the soap-suds left from the washing;" and he observes that during 1880 the garden crops were very badly attacked as usual, and field crops again almost untouched. Mr. T. M'Donald mentions that the Carrot Fly was very injurious this season on the same ground that was used last year; and observes that the Altringham was much helped by frequent watering with salt water.

Mr. D. Sym Scott reports that at Ballinacourte, Tipperary, the Grub of this Fly appeared about the 1st of July, and he observed that the attack was most severe in the centre of the field, on a portion of

ground which did not receive the same treatment as the rest with regard to manuring, and where consequently the plant was more feeble than on either side. He considers that bad manure and the want of having applied salt were the cause of the attack, and recommends that good manure, rich and well rotted, be ploughed in at the autumn ploughing, and artificial manure with salt be applied in the drill at sowing time. With regard to prevention Mr. Sym Scott notes, "I kept some women pulling out every plant as it showed symptom of the Worm and had them removed from the field, which I believe was a great means of saving part of the crop." This Grub is noted on the 15th of July as taking Carrots in small patches at Tangley, Guildford; soot and paraffin were applied, and the Carrots afterwards showed very good roots at the spots where this dressing was given, which had been the worst points of the attack.

In my garden at Dunster Lodge, near Isleworth, where the Carrots are subject to attack from this Fly, I had a small plot prepared in the spring by digging the soil entirely out to the depth of eighteen inches. This space was filled in again with a mixture of about one-third leaf-mould of decayed Elm leaves, one-third of the loam that had been dug out, and another third composed of coal-ashes, broken peat, and a little white sand, well mixed together. The Carrots were sown on the 12th of March, and did very well till the end of June, when they were thinned, and very shortly the Grub appeared amongst those most disturbed by thinning. I watered them well with dilute soluble phenyle, and further on repeated the application in still more dilute form, pouring it over the leaves, and then giving a good washing with pure water. The Fly attack was stopped, and the Carrots grew vigorously.

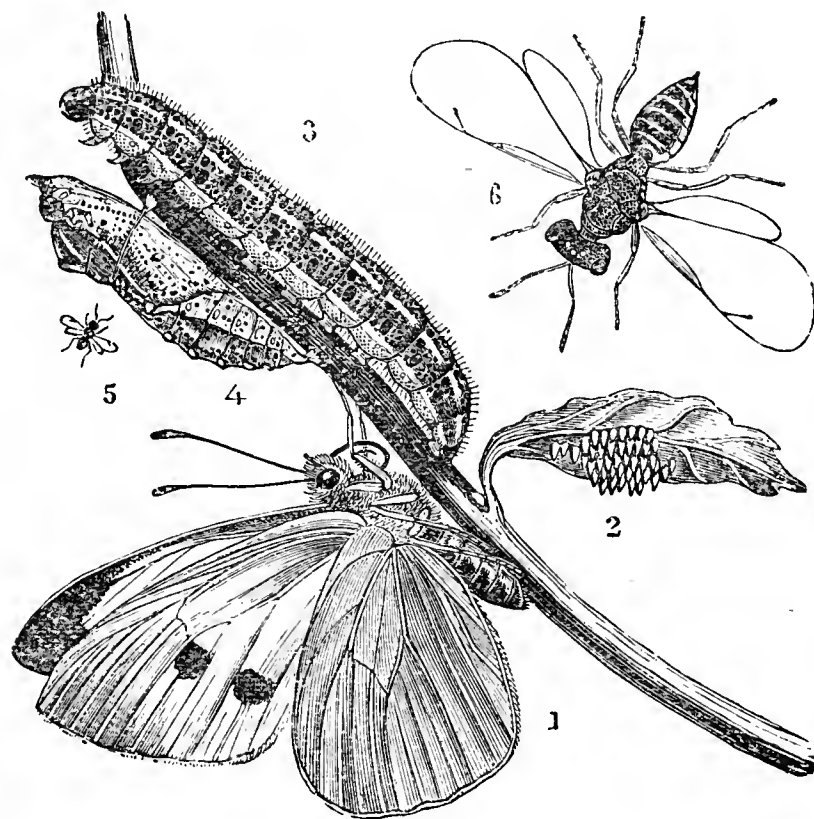


APHIS RUMICIS.

1, Bean-shoot, with Aphides; 2, male; 4, female (both magnified).

10. Aphis rumicis. Bean Aphis; Collier. This was very bad in some parts near Dalkeith during the hot weather of July and August.

Topping the shoots, taking off the infested parts, and destroying the insects is mentioned by Mr. Dunn as the speediest and most effective remedy; it ought to be done at once, on the first appearance of the Aphis, to prevent it spreading. Mr. E. A. Fitch mentions that on the 7th of July he noticed one of his fields of Beans nine acres in extent, at Maldon, covered with "Collier." The tops of the Beans of about six acres were cut off with brushing hooks by men walking along the stetch furrows, but the attack went off as suddenly as it appeared; no difference was noticeable in its amount between the six acres cut back and the three not meddled with, but it is not mentioned whether the cut tops with "Colliers" on them were removed. The first observation of the attack was on a day of much rainfall, which proved to be of some days' duration, and presumably cleared the Aphides. Mr. James Long, of Old Field, Henlow, Herts, mentions the appearance of the Collier on his ground early in July, and much damage threatened; saved, however, by the violent rains, which cleared the plant-lice, and invigorated the growth of the crop.



PIERIS BRASSICÆ.

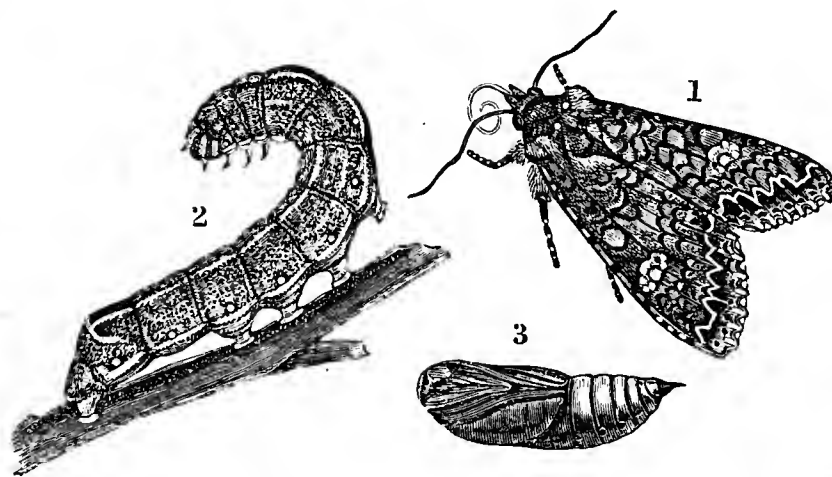
Large White Cabbage Butterfly, eggs, larva, and pupa. Parasite Fly,
Pteromalus brassicæ, natural size and magnified.

11. *Pieris brassicæ*. Cabbage Butterfly. Mr. M'Kinlay observes that after the dry weather set in the Cabbage Butterfly was to be seen in large numbers in gardens near Dingwall, and proved very destructive. The remedy (recommended by Mr. Malcolm Dunn in the Report for 1879) of giving a sprinkling of fine salt was found serviceable, as also the simple plan of laying some branches of Broom

on the Cabbages which were most infested. This is found to act well as a preservative from attack. The Cabbage Butterflies are also mentioned by Mr. Russell as very numerous, and the Caterpillars as destructive this year (especially in cottage gardens) at Lochgilphead, Argyllshire; but Blackbirds, Thrushes, and small birds are noted as numerous, and as doing good service in keeping down attack. In the Isle of Mull the Large White was not nearly so plentiful as during last season. At Callander, Falkirk, it is noted as almost entirely absent; and at Oxenford Castle, Mid Lothian, not a single specimen was seen. Mr. Malcolm Dunn notices the Cabbage Butterfly as not numerous at Dalkeith till the autumn, when the Caterpillars appeared in considerable numbers, and ate up the Savoy and Cabbages in some gardens. It is noted that the Caterpillars may be killed by a dusting of caustic lime, or a watering with weak brine, lime-water, or soap-suds. The Small White is mentioned by Miss Birchall as doing some amount of damage at Douglas, in the Isle of Man; and this species is also mentioned by Mr. Brunton as very plentiful at Glenarm, Co. Antrim, Ireland, in August and September. Mr. Willoughby Gardner notices the very early appearance of the *Pieridæ* at Conway, fresh specimens of the Small White being out on March 26th; and Mr. Bairstow, writing from New Brighton on the same day, mentions the Cabbage White as occurring in numbers along the rocky slope of a mountain about half a mile from Llandudno Junction, where the caves and openings in the mountain make the locality peculiarly favourable for their habitation and recreation-ground.

Mr. Edw. Parfitt observed the first "Small White" on the 27th of March, the second on the 29th, at Exeter, these being fresh specimens, and he mentions that the Small Whites were more numerous in the spring than he had ever observed them before. Mr. D'Urban also mentions the Small White as appearing in greater numbers than he had ever before noticed them, and as extremely destructive to Cabbages about Exeter in August and September. The Savoy and other Cabbages were reduced to mere skeletons, and hand-picking was resorted to. Mr. H. J. Dobson notes the Butterflies of the Large and Small Whites as very plentiful, flying everywhere at New Malden, Surrey, during the dry weather of May, and that they were plentiful in all stages at the end of August, which was a warm month, with little rainfall after the first six days. The Caterpillars of the Small White are noticed by Mr. Hart as having been plentiful on Cabbage of all kinds and on Swedes, at Kingsnorth, Kent. Mr. Charles Foran mentions the *P. rapæ* as first seen at Eastbourne, Sussex, on the 13th of March, and the *P. brassicæ* on the 20th of April, neither of the species being more numerous than in ordinary years. Mr. Fitch notes that at Maldon, Essex, his Cabbages were "far from improved

by *P. rapæ* larvæ in August;" and the Cabbage Butterfly is mentioned as troublesome at the Manor Park, Little Ilford, Essex, in July and August, when the Caterpillars literally riddled the crop, but disappeared after a few cold nights about the first week in September. They were very destructive at Sedbury Park, West Gloucestershire, from August to October, and at Little Faringdon they became plentiful after August 15th. The Butterflies of the Large White were exceedingly abundant at Warminster, Wilts, in June and July.



MAMESTRA BRASSICÆ.
Cabbage Moth, larva and pupa.

12. Mamestra brassicæ. Cabbage Moth. Mr. Hart notices that the Caterpillars have done much mischief to the autumn Cabbage and Savoy, eating their way into the Cabbage to such an extent that it is to be feared as winter sets in more Cabbage will rot than will be eaten. The Caterpillars are also mentioned by Mr. D'Urban at Exeter as very plentiful from June to September on almost everything. Miss Birchall, writing from Douglas, Isle of Man, notices the Caterpillar as stripping the plants of Beet in the garden, apparently preferring it to other food. At Braham Castle, Dingwall, Mr. Simpson notices the Caterpillar as troublesome to late planted Cabbage, and that on the 28th of October they were quite lively, and feeding inside the recurved leaves, although ice was then covering the outer leaves of the Cabbages. Mr. Malcolm Dunn notes that this Moth appeared rather numerous at Dalkeith, and especially in weedy and neglected gardens, or those surrounded with hedges full of weeds, amidst which the Moth harbours, and, as the Caterpillar is very difficult to deal with in the hearted Cabbage and Savoy, he draws attention to the importance of stamping out the Moth, and destroying its places of refuge amongst weeds in waste and neglected places.

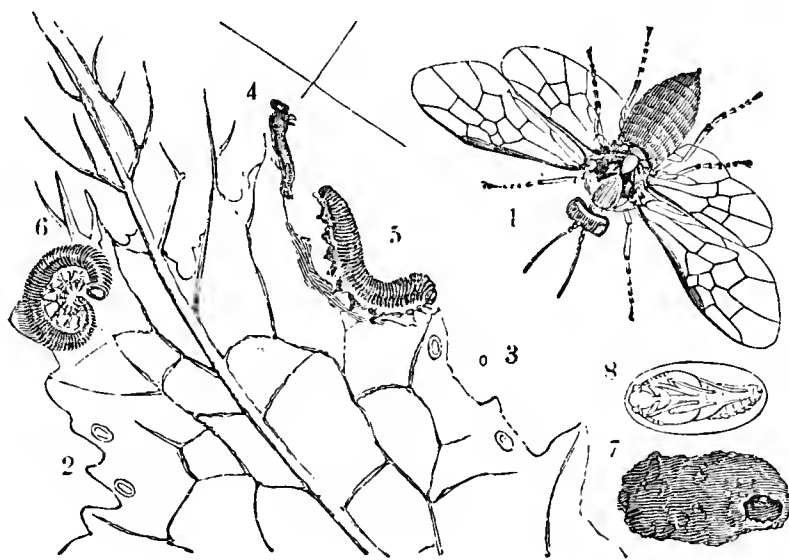
Mr. Wilkie mentions the Caterpillars as not prevalent at Ardinglas, Argyllshire, although common in June, and that hand-picking is the general means used for their destruction. At Poltalloch, in Argyllshire, Mr. Russell mentions that the Caterpillars were injurious,

and a dressing of soot and lime was found beneficial for keeping them in check. In my own garden, near Isleworth, I found great benefit from sprinkling the Cabbages with gas-lime from a heap that had lain for about four months exposed to atmospheric action. The weight of the finely crumbled material carried it down, and lodged it in the crannies of the hearted Cabbages, and made any traffic about the Cabbage so unpleasant to the Caterpillars as apparently to check any attack from additional ones crawling up the stem. I also sprinkled it liberally round the Cabbages, and, though it was not in all cases a complete preventive, it did much good. The gas-lime at this stage of exposure to the air in no way injured the leafage, and it acted well as a preventive of attack from Slugs as well as Caterpillars.

13. *Agrotis segetum*. Turnip Moth. Common Dart Moth. Scarcely noticed.

14. *Phyllotreta undulata*. Turnip Fly. Mr. Malcolm Dunn, Dalkeith, mentions that the practice of using the water-cart for watering Turnips affected by the Fly has been common in the Lothians for a good many years, wherever water is conveniently attainable. During the present season (1880) he had seen several water-carts in use where the Turnip Fly was troublesome, and the ground hard and dry. In the case of a field of Turnips about two miles east of Edinburgh, that would not start till the water-cart was resorted to, the Turnips were afterwards as fine as any in the district. Mr. A. Shearer notes that at Yester, East Lothian, the Turnip Fly did little or no harm this year. June was a dry month, but nearly five inches of rain fell in July, this being much above the average rainfall. At Marchmont, Berwickshire, Mr. Loney mentions the Turnip Fly as scarce, and since the rains of September the Turnip crop increased immensely in value. Mr. Service mentions that the Fly occurred at Maxwelltown, Dumfries, during the first ten days of June, but in few instances to any injurious extent. The beginning of June was dry, and rain coming on was unfavourable to the increase of the Fly. Mr. Service observes that guano is sometimes applied in the district, with a view of forcing on the plants beyond the reach of the Fly. Turnip Fly is mentioned by Mr. Simpson as having proved very troublesome on some farms near Dingwall, Ross-shire, especially along the sheltered sides of the fields. Re-sowing was contemplated in some cases, when showery weather set in and saved the plants, at the same time that it cleared the Fly. At Poltalloch, in Argyllshire, the Turnip Fly is noted by Mr. Russell as rather destructive amongst the first and second sowing of Turnips, and a dusting of lime and soot is noted as having been found serviceable in destroying the insects. The Fly is

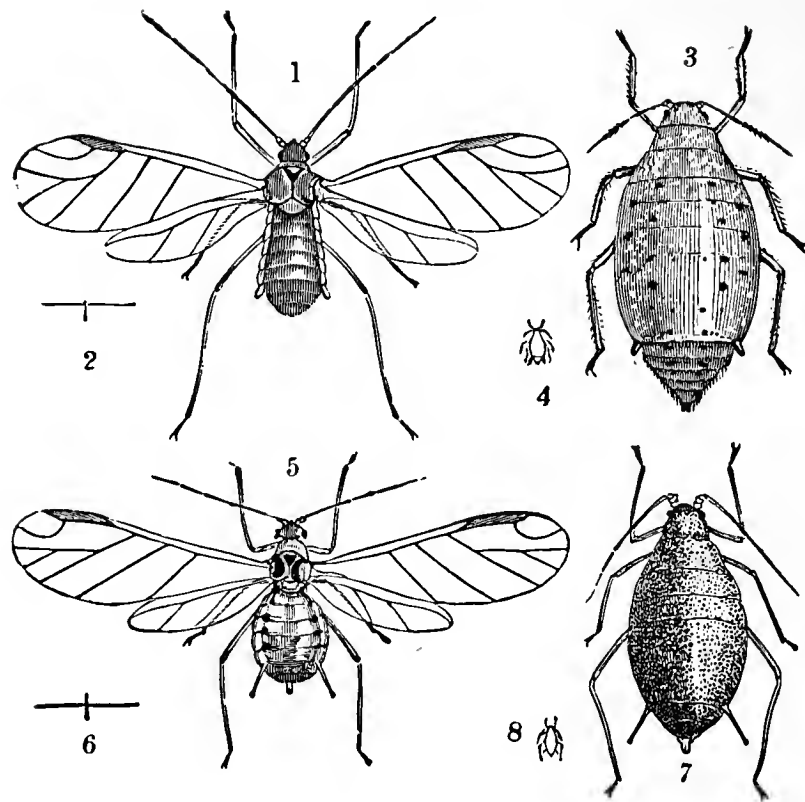
reported by Mr. Grierson as very prevalent in the Isle of Mull, where several patches had to be re-sown. The failure was ascribed to the dry weather. A slight attack of Fly is reported by Mr. Brunton as occurring at Glenarm, Co. Antrim, Ireland. At Guildford; at Maldon; and at Exeter the absence of Fly is noted. Mr. Long mentions that at Henlow, Herts, the Turnip Fly has not been injurious this season, and that it hardly ever is so when the soil is thoroughly moistened. Mr. Wailes, writing from Beacon Banks, Easingfold, Yorkshire, mentions that Fly is caught by wheeling a board (to cover two rows) painted with treacle or some similarly sticky substance, so that the Fly leaping from the leaves on disturbance adheres to the surface, and is killed. Mr. Wailes also draws attention to the importance of the plant being pushed into vigour by good manuring, and notes that the Fly does not thrive in blowy, rainy weather.



AHALIA SPINARUM.
Sawfly, larva and pupa.

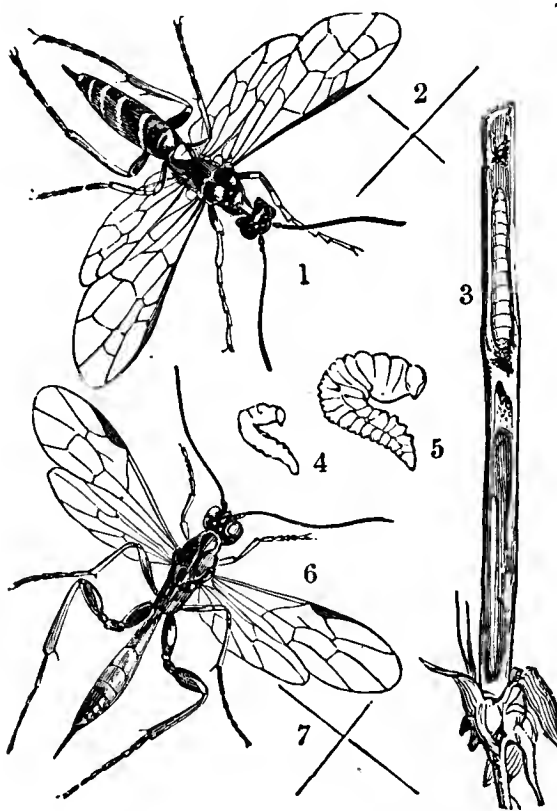
15. *Athalia spinarum*. Turnip Sawfly; Niggers; Black Palmer. Mr. Service notes that this is rarely injurious in the neighbourhood of Maxwelltown, but that he has often met with the insect when collecting, and has met with it during this summer as usual. Dusting with caustic-lime is mentioned as a good remedy by Mr. Dunn. Mr. Hart notes that he has used sheep and lambs with good effect in an attack of "Niggers" on Turnips in August. About 100 of them were driven backwards and forwards for an hour three days in succession, which quite cleared the plants, and did no injury to the animals. This attack is noted by Mr. Hart as the only one he ever had to deal with, and he tried several recommendations before resorting to the "droving," but they were all useless.

16. *Aphis rapæ*. Turnip Aphis. Mr. Malcolm Dunn notes that this was rather plentiful at Dalkeith in dry weather, but soon disappeared.



APHIS RAPÆ.

1—4. Turnip-flower Aphis, *A. floris-rapæ*. 5—8. Turnip-leaf Aphis, *A. rapæ*.

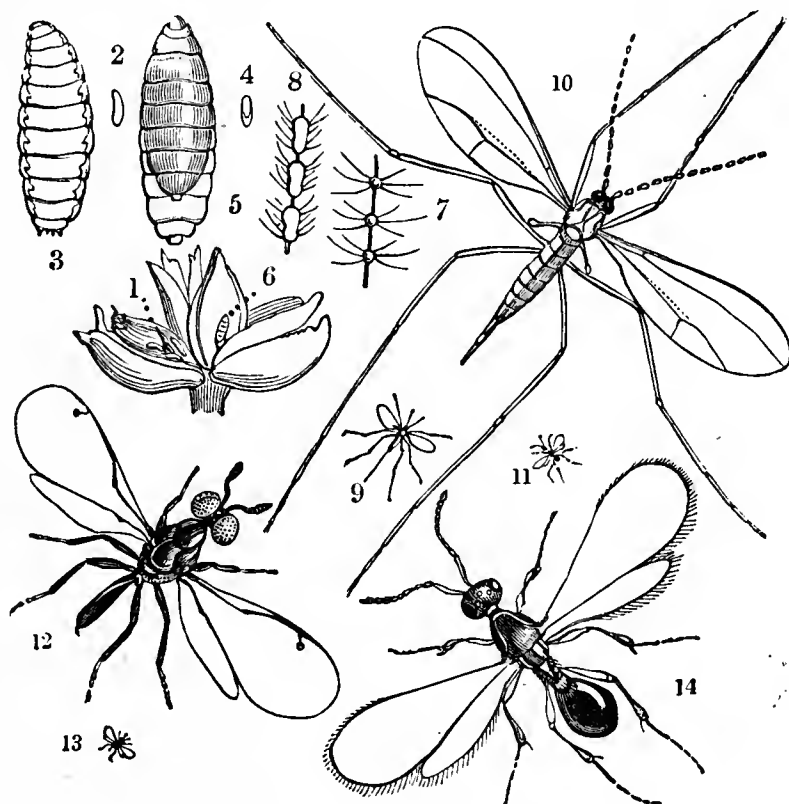


CEPHUS PYGMÆUS.

1—5. Corn Sawfly and larva, natural size and magnified, and infested Corn-stalk.
6. Ichneumon Fly, natural size and magnified.

17. *Cephus pygmæus*. Corn Sawfly. As the insect occurs in this country, and is seriously hurtful to Corn crops on the Continent, it is desirable to draw attention to it, but hitherto it has hardly been recorded by any of the observers, and though numerous in two localities during this season, it has not caused much mischief. It

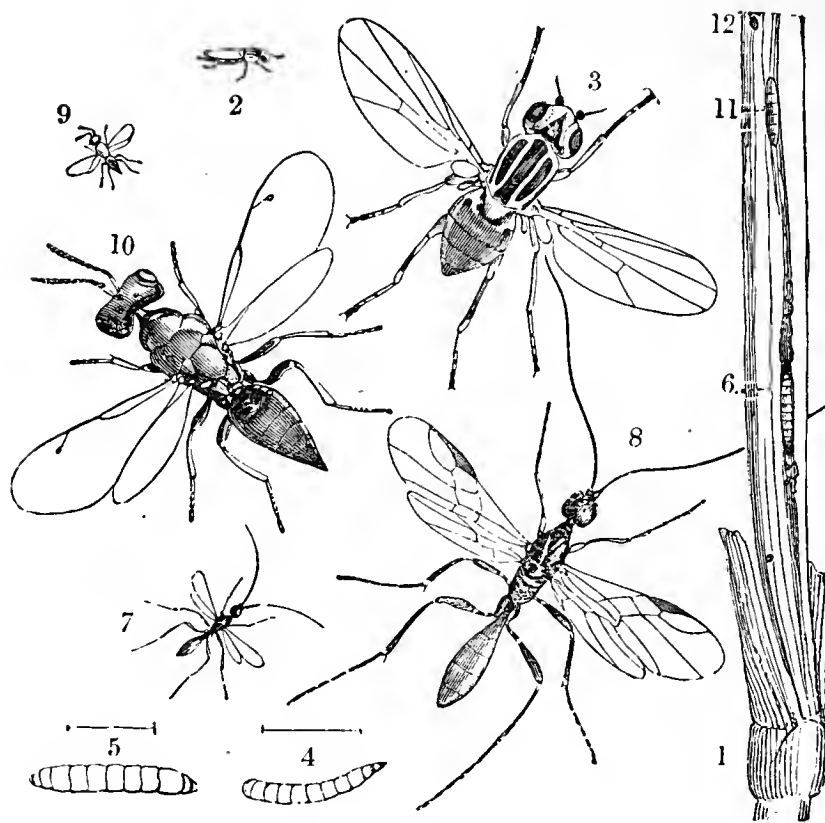
will be of interest to notice whether it appears again to any great extent in the coming season. Mr. Hart mentions it as in great numbers on his Corn at Kingsnorth, Kent, on June 19th, but it was not noticeably injurious. Mr. Fitch notes this Sawfly as being more numerous than he ever knew it. At the end of June (when at all bright between the frequent storms) almost every buttercup flower had its *Cephus* visitor, and often two or three in one bloom, but no larvæ or traces of larval presence were noticeable.



CECIDOMYIA TRITICI.

1—10. Infested floret, Wheat Midge, larva and pupa, natural size and magnified, and antennæ, magnified. 11 & 14 and 13 & 12. Parasite Flies, natural size and magnified.

18. *Cecidomyia tritici*. Wheat Midge; Red Maggot. Mr. Hart first noticed this Fly on June 25th, and the "Red Maggot" in the Wheat-ears on July 9th; and he considered that although the principal cause of the failure of the Wheat crops at Kingsnorth, Kent, was from mildew, that part of it must be attributed to the "Red Maggots." These were found by Mr. Hart to be common on all his Wheat, sometimes as many as a dozen being on one grain, and the attack was by far the worst that had occurred for some years; last year scarcely one Maggot was observable. At Maldon, in Essex, these Red Maggots were most noticed by Mr. Fitch from the 10th to the 20th of July, but little injury was caused by them. Their absence was attributable to the wet and stormy July, this being the season when the parent Flies are active and busy ovipositing.



CHLOROPS TÆNIOPUS.

2—6. Corn Fly, larva and pupa magnified, and natural size or length given by lines, and infested Corn stalk. 7 & 8 and 9 & 10. Parasite Flies, natural size and magnified.

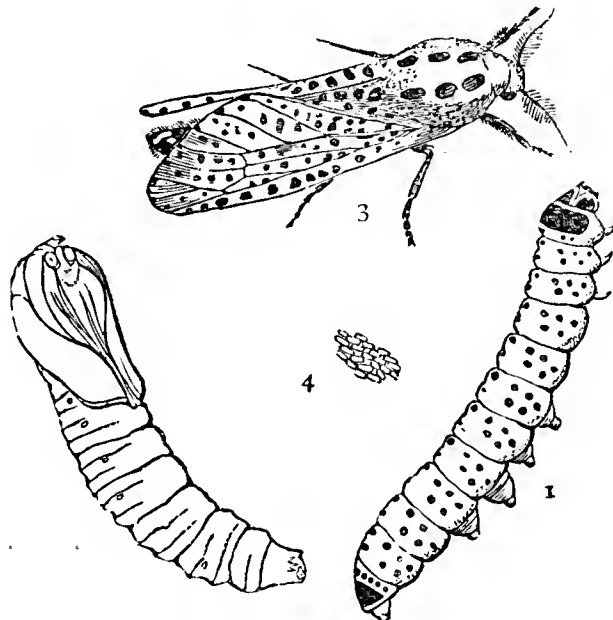
19. *Chlorops tæniopus*. No observations.

20. *Aphis granaria*. Wheat Aphis. A few species were noticed on Wheat-ears at Maldon, during August, by Mr. Fitch, but no real attack.

21. *Cossus ligniperda*. Goat Moth. This has been much more numerous than is usually the case near Maldon. Mr. Fitch noticed as many as eight or ten of the Moths; the empty pupa-cases were noticeable protruding from old Willow trunks, and in the autumn the full-grown larvæ were more than ordinarily common. Mr. Bairstow also mentions that *C. ligniperda* has been more than commonly plentiful. Mr. Malcolm Dunn notes it as not numerous in the district round Dalkeith, and that it is a good remedy to inject paraffin by a sharp-nozzled syringe with as much force as possible into the holes where the Caterpillars are working. Mr. Simpson notes that an old Oak cut down on the Brahan estate, near Dingwall, was found to contain hundreds of the Caterpillars, from a quarter of an inch to four inches long, with empty chrysalis-cases in the bark.

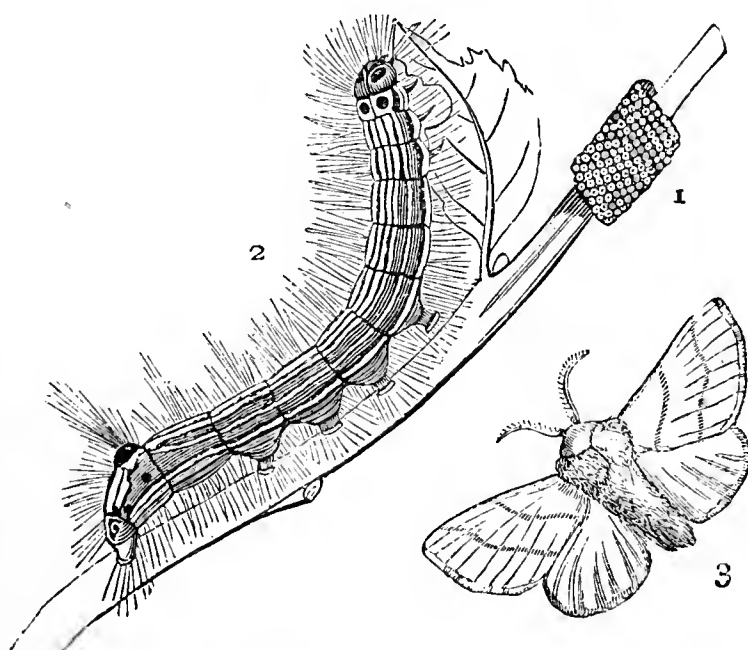
22. *Zeuzera Æsculi*. Wood Leopard Moth. This is mentioned by Mr. Robert Coupar as very numerous at Craighall, Blairgowrie, many empty pupa-cases being observable in young Poplars at the water's

edge. This Moth was quite unnoticed at Maldon, where in the previous year (1879) it was plentiful. A note is given of a Caterpillar of this Moth being found in the stomach of a Cuckoo. Mr. Shipman mentions that the Fruit and Timber Trees at Ivy House, West Ham,



ZEUZERA ÆSCULI.

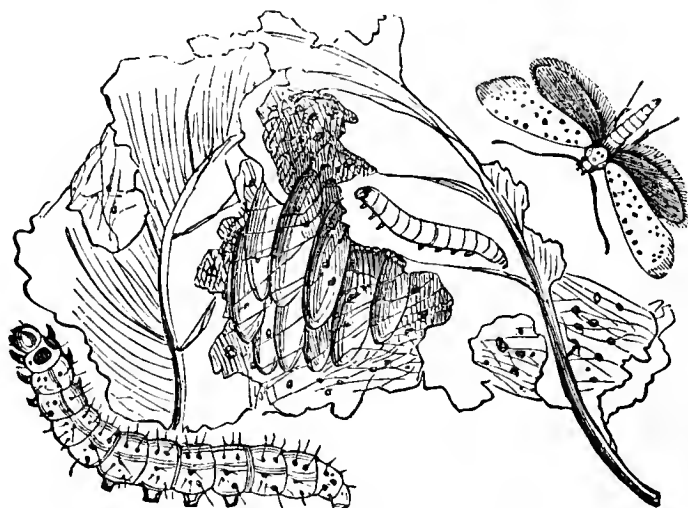
Essex, have suffered very much this season from the Caterpillars of the Leopard Moth; and he adopts the method of forcing a strong wire up the boring of the Caterpillar to destroy it in its hole. He points out that if when the wire is withdrawn it is found to have wet whitish matter on it the Caterpillar may be presumed to be killed; or where the presence of the Caterpillar has been shown by the woody matter it discharges lying outside the boring, that if this is cleared away and no more appears the work of destruction may be considered completely performed. The application of paraffin, as described above, is noted as also a good remedy for destroying the Caterpillar of this Moth.



BOMBYX NEUSTRIA.

23. Bombyx neustria. Lackey Moth. Rarer than usual, both as to Caterpillar and Moth, at Maldon. Rather common, but not

nearly so many as usual, at New Malden, Surrey. Only one specimen observed at Craighall, Perthshire.



YPONOMEUTA PADELLUS.

24. *Yponomeuta padellus*. Small Ermine Moth. Mr. M'Donald notices this as very destructive this season near Kirkwall, Orkney; and Mr. Simpson also mentions that at Brahan Castle, Ross-shire, it was very destructive to Plum trees, and especially so on the under branches of standards, and on walls facing the east. Trees on walls having a west aspect were quite free, which is ascribed to the wind and rain during the season being mainly from the west. Mr. H. J. Dobson mentions that the Caterpillars of these Moths completely destroyed the foliage of two Whitethorn hedges at New Malden, Surrey, these hedges being half a mile apart, and the same that were attacked by the Caterpillars of *Liparis auriflua*, the Yellow-tailed Moth, last year. Mr. R. A. Rolfe notes that in June the hedges near Nottingham were swarming with these Caterpillars, their webs abounding to a greater amount than he had ever seen before. The Fruit trees also suffered, but not nearly so much as the quick-hedges, which appeared as if scorched from the injury to the leafage.

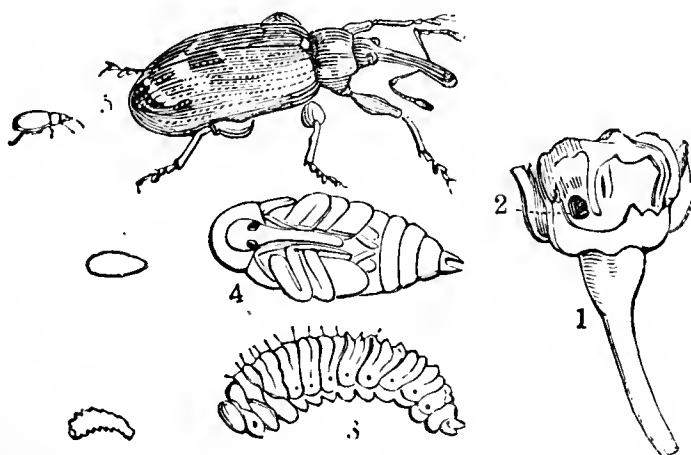
25. *Abraxas grossulariata*. Magpie Moth. Mr. M'Donald notices the *A. grossulariata* as destructive to Gooseberries and to Red and White Currants at Kirkwall, Orkney, and that dusting with hellebore powder is an effectual remedy. It is also noticed by Mr. Russell as plentiful at Poltalloch, Argyllshire, on Black Currants at the north side of a wall, and a good deal of damage was done. Hellebore and hand-picking was resorted to, to clear them. At Dalkeith this attacked Gooseberries and Currants rather severely during the summer. Mr. Dunn notes that a dusting of powdered hellebore, first wetting the bushes to make it stick, is a sure and easily applied remedy; but care must be taken to see that the powder is perfectly washed from the berries before they are used, as it is a dangerous

poison. Mr. Anderson mentions that this Moth is never seen at Oxenford Castle, Mid Lothian. This is noticed by the Rev. W. F. Adams as very plentiful at Little Faringdon, Lechdale, and the larvæ as being numerous on the Currants; but the development was much checked this year by Ichneumon Flies. Mr. Arkwright, of Hampton Court,



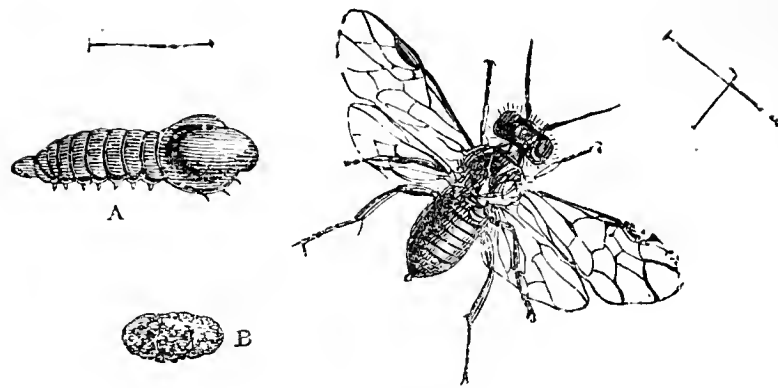
ABRAXAS GROSSULARIATA.

Herefordshire, mentions the Caterpillars of *Abraxas grossulariata* as being the greatest pest in his garden this season; the means of prevention used were syringing the leaves with Gishurst compound. Mr. F. Norgate notes the "larvæ common at Sparham from the 6th to the 18th of June, but almost confined to Blackthorn. Not injurious." Mr. E. A. Fitch also notices the Caterpillars as numerous at the end of May and throughout June on Blackthorn, at Maldon, Essex. By the middle of July the Moths were very abundant, and the Caterpillars still plentiful, but not a single specimen was to be found on Gooseberry or Currant. At New Malden, Surrey, they were rather common. At Kingsnorth, Kent, not one Caterpillar, and only two Moths were observed by Mr. Hart during the season.



ANTHONOMUS POMORUM.

26. Anthonomus Pomorum. Apple Weevil. This is mentioned by Mr. Sutherland as very destructive at Langwell, Caithness.



ERIOCAMPA ADUMBRATA.

27. *Eriocampa adumbrata*. Pear-Tree Slug. Mr. Dunn mentions this as being again rather numerous at Dalkeith, but easily got rid of with soap-suds and a powerful garden engine, applied at once as soon as the insects are seen. A few noticed on Cherries and Pears at Maxwelltown, Dumfries, by Mr. R. Service, but the attack not to an injurious extent, excepting on some large trees of Bird Cherry, *Prunus padus*, which were badly defoliated. Also sparingly noticed by Mr. Fitch, at Maldon, on Cherry and Blackthorn, but not on certain Pear trees which in former years have been badly attacked.

28. *Nematus Ribesii*. Gooseberry Sawfly. This appears to have been more prevalent in England than in Scotland; and it is mentioned by Mr. Brunton that at Glenarm, Co. Antrim, it also only made its appearance in such small quantities that a few handfuls of roached lime scattered over the infested bushes soon stopped the ravages. Mr. Sym Scott mentions that at Ballinacourte, Tipperary, the Gooseberry Caterpillar made its appearance on the 17th of May (which he notes as curiously enough the same date at which it appeared in 1879). He put on hands at once and cleared the garden; and thus, although very numerous, the insect was completely checked. At Torloisk, in the Isle of Mull, little damage was caused by the Caterpillar. Mr. Loney observes that the Caterpillars have been scarce at Marchmont this year, and that syringing with tobacco-water is a good remedy if taken in time. At Craighall, Perthshire, Mr. Coupar notes the Sawfly as not as common as in previous seasons. At Skibo, Sutherlandshire, Mr. Forbes mentions the attack as slight this year, and finds hand-picking, if taken in time, the best cure. Mr. Sutherland notes the Sawfly as first observed on the 20th of May at Langwell, Caithness, and has the Caterpillars shaken from the bushes and crushed. He also finds that sprigs of Broom laid on the Gooseberry bushes are a good preventive of attack, as the Sawfly dislikes the smell, or for some reason has an aversion to this plant. Mr. Sutherland finds that if pieces of woollen cloth are laid in the bushes the Sawfly will deposit her eggs on them, and thus many may

be got rid of. Mr. M'Kinlay, Dingwall, gives the very excellent advice that when there is reason to fear an attack the soil should be removed to the depth of two inches round the bushes in the early spring, and a good sprinkling of lime dusted round each bush. By this means the Caterpillars are cleared away and destroyed.*

With regard to remedies, scattering lime round the bushes was tried with fair success, as also putting a bunch of Broom in the middle of each bush. Mr. M'Kinlay also found syringing with water of a warmth that was just bearable to the hand was a good means of clearing the Caterpillars; but he cautions as to the necessity of experimenting first as to what warmth the foliage will bear, as tender leafage may be discoloured or killed by a warmth that may be perfectly safe to use a few weeks later. At Brahan Castle, Dingwall, Mr. Simpson reports the Caterpillar as very abundant on above 700 Gooseberry bushes in June, together with Green Fly which covered the points of the young shoots. The bushes were gone over in June, and the Caterpillars and Green Fly gathered into baskets and destroyed, and the bushes were clear afterwards. Mr. Russell notices the Caterpillars as being less abundant than usual at Poltalloch, Argyllshire. Mr. Service mentions amongst remedies used in the district of Maxwelltown that soap-suds syringed on the bushes were very useful; also that it is said that fresh tan-bark from the tan pits put on the ground under and around the bushes during the winter destroys the insect. Mr. Anderson mentions that there were a few larvæ in the gardens at Oxenford Castle in most years, but for twenty years they have not occurred in any quantity. The surface soil under the bushes is annually removed in winter, a deep hole is dug in one of the quarters, and in this the removed soil, with whatever may be in it, is buried. The soil under the Gooseberry bushes is replaced by that out of the hole, with the addition of some manure. It will be observed in this plan of treatment that Mr. Anderson mentions he has a *deep* hole dug: this is important to notice, as if there was only a light covering many of the larvæ would not be the worse for being moved, and come up again in the spring to infest any Gooseberry bushes near enough for them to crawl to.

Mr. Whitton, Coltness, Lanarkshire, notices that the Gooseberry Caterpillar (*N. Ribesii*) made its appearance soon after the bushes were in leaf, and first on those that had been attacked the previous season; and he observes that they used sulphur-powder, as recommended by Mr. M'Corquodale, p. 27 of Report for 1879, and found it as efficacious as hellebore-powder, without the fear of possible evil consequences

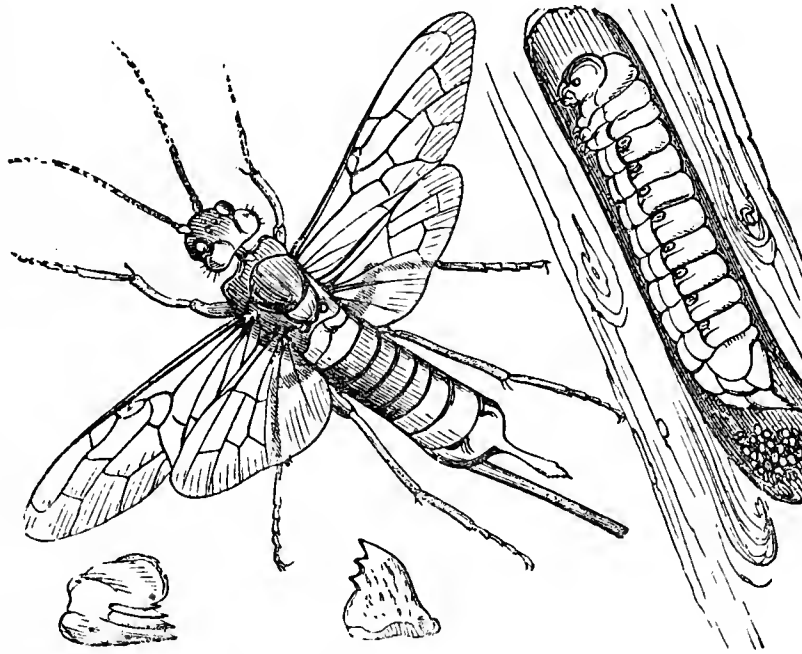
* The Caterpillars go down into the ground beneath the bushes in the autumn, and change to pupæ in the spring, and the moths from them come up again when the leaves are beginning to come out. The treatment above advised gets rid of them thoroughly.—ED.

from using poison. Mr. M'Laren, Hopetoun, Queensferry, notes that a solution of alum in water, applied lightly by means of a watering-can, is useful in clearing the Caterpillars. Mr. D'Urban, writing from Exeter, notes the Sawfly as very destructive in the middle of May to Gooseberries and to Red Currants, but afterwards it did not give much trouble, the long drought being apparently unfavourable to the insect; and he adds a caution regarding danger in the use of hellebore powder from risk of the powder not being thoroughly washed off the berries. Mr. Matheson, after mentioning that when bushes are very badly attacked dry hellebore-powder puffed over and through the bushes kills all it touches, adds that a good washing with the garden-engine will clean the fruit of the powder, but that it is very necessary for the operator to well protect the nostrils, for the powder has a most irritating effect, causing excessive sneezing.* Mr. Matheson notes that the Gooseberry Caterpillar was very injurious this year at Addington, Bucks, from the middle of May. He remarks that the bushes require careful watching from the first unfolding of the leaf. The first sign of the Caterpillar presence is generally some of the leaves looking as if riddled with dust-shot, and every leaf so attacked should be picked off at once and destroyed, being the home of two or three dozen Caterpillars, which in a few days would spread over many leaves.

At Kingsnorth, Kent, the Caterpillar was so abundant that the bushes in many gardens were almost defoliated. Mr. Hart notes that he prevented serious injury to his own bushes by shaking down the Grubs whilst quite small and crushing them on the ground, and by hand-picking later on. Near Guildford the Caterpillars were at work by the 20th of April in a warm garden. Mr. Long mentions the Gooseberry Caterpillar as very numerous this season at Henlow, Herts; and Mr. Fitch notices that the Caterpillars were so numerous that the Gooseberry and Currant bushes in his own garden at Maldon were more or less defoliated by them. He mentions that hand-picking failed to check the ravages as it had done before, but conjectures that this was from the operation not being as carefully performed. The first brood of Caterpillars, which were very abundant at the beginning of June, appeared most partial to the Gooseberry bushes; the second brood, which appeared about the middle of July, chiefly infested the Currants. At Little Faringdon, Lechlade, the Rev. F. Adams notes the Caterpillars as having almost destroyed the Gooseberries and Currants, and that the crop was only saved by hand-picking, and

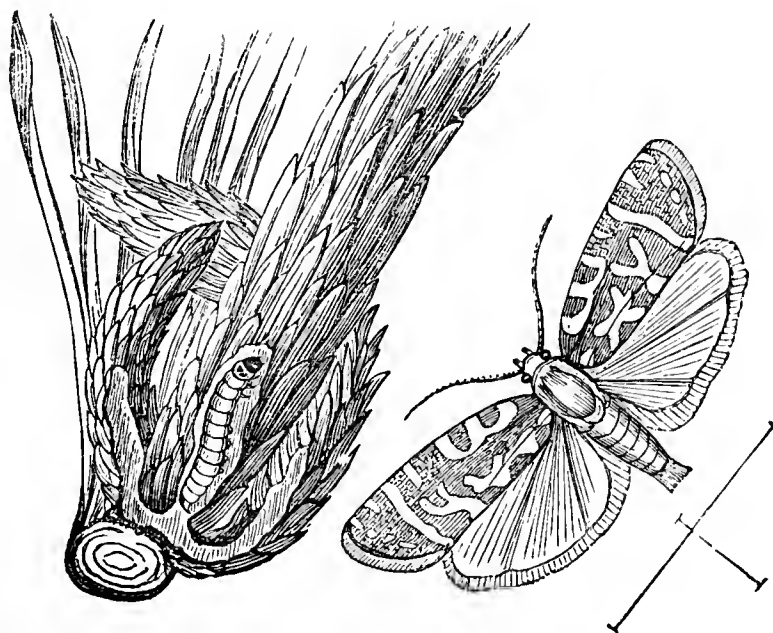
* Looking at the unpleasant effects on the operator, the risk of the berries not being washed clean, and the serious illness likely to follow on hellebore-powder being swallowed, the remedy appears to me only admissible under the most careful superintendence.—ED.

shaking the bushes into sheets placed under them. Mr. Scowcroft observes that the crop of Gooseberries was small at Ormskirk in consequence of the severe attack of the Caterpillars on the bushes in 1879; but at the date of writing there had not been any great number of Sawflies.



SIREX GIGAS.

29. *Sirex gigas*. No observations.

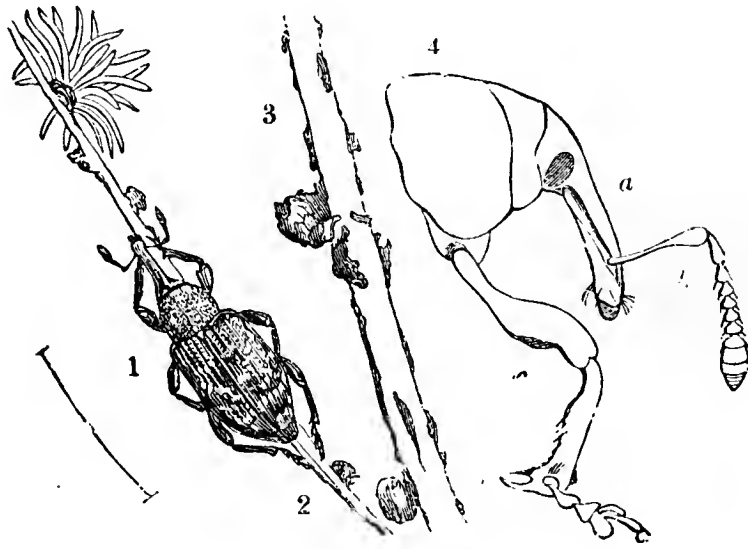


RETINIA TURIONANA.

30. *Retinia turionana*. No observations of the present season.

31. *Hylobius Abietis*. Mr. Wilkie notices that although this Beetle was much less destructive at Ardkinglas, Argyllshire, than in the two preceding seasons, yet it attacked numbers of young plants

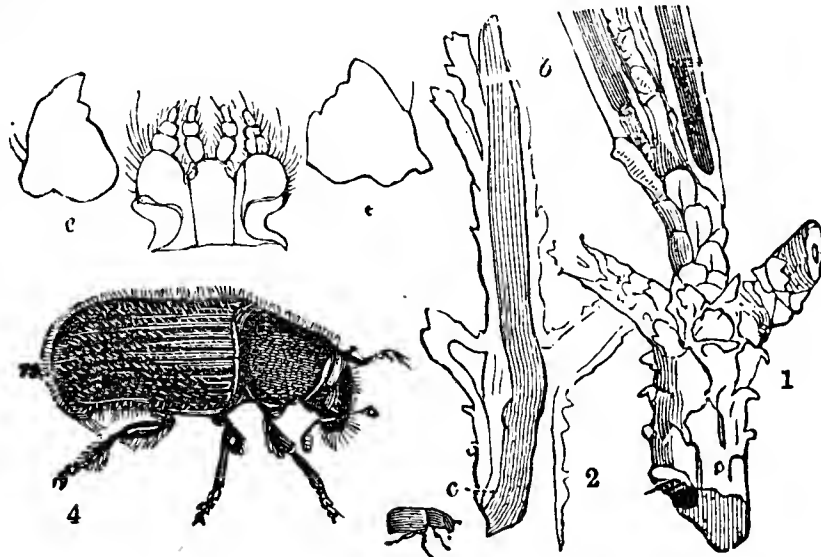
not only on ground recently replanted, but also in several isolated cases where a crop of timber had not formerly been grown. The Weevil also attacked several plants of *Picea Lasiocarpa* in a pinetum that had recently been formed on the estate. Mr. Wilkie observes



HYLOBIUS ABIETIS.

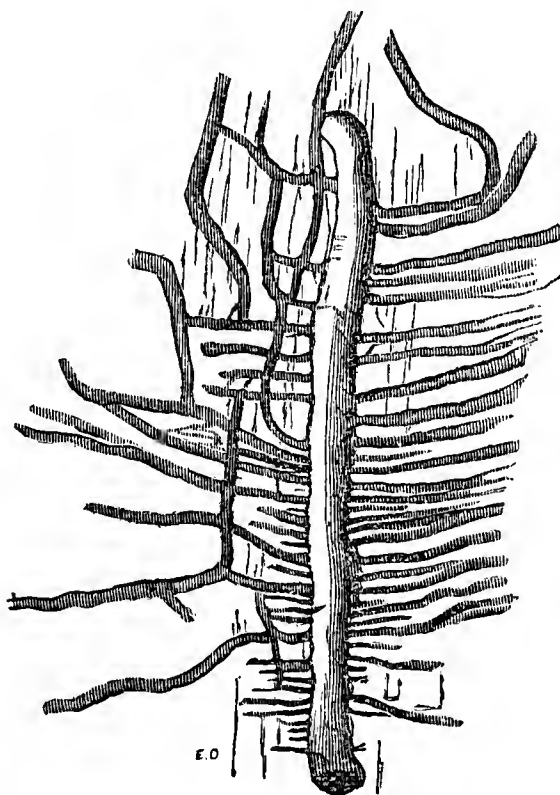
that, as far as his personal experience goes, the best method of preventing the propagation of this insect is carefully to cut down all dying trees and remove them (and all other old wasting timber), and burn or otherwise destroy them. Hand-picking is not very successful, as the Beetles drop from the trees on disturbance. Mr. Wilkie observes that all the plants to which "Messrs. Davidson's composition" had been applied (to keep off rabbits) had been quite free from Weevil attack. Mr. M'Laren, Hopetoun, East Lothian, also notices the difficulty of doing any good by hand-picking in consequence of the Beetles feigning death on disturbance and falling to the ground, where from their greyish colour they are difficult of observation, and mentions the best cure in this case was to set boys to pick them into wide-mouthed bottles and destroy them. Mr. M'Laren mentions that in the first attack of this Beetle, which came under his notice some years ago at Lennoxlowe, in East Lothian, their attacks were chiefly directed against the Larch (in the first June after they were planted), commencing at the ground and stripping the plants of their bark, thereby causing the death of a considerable number before the real cause was discovered. To prevent the attack recurring the Beetles were traced to their breeding places (old Firs lying on the ground), and these were burned. Mr. W. Robertson, writing from Blinkbonny, Earlston, mentions that the *H. abietis* has again been present on the plantations this season, and considers that where planting has to be done on a large scale, and the Beetle is present to any extent, the best plan is to take out as many of the old roots as possible, burn all the rubbish that is lying about, and graze the ground with cattle for three or four years

before re-planting. Mr. Robertson thinks this method succeeds best in the end, as planting where there is Pine Weevil is one of the most precarious operations a forester can undertake.



HYLURGUS PINIPERDA.

32. *Hylurgus piniperda*. Mr. Wilkie, Ardkinglas, Argyllshire, notices the *Hylurgus piniperda* as prevalent on some of the older Pines, but that it was comparatively limited in young plantations. Mr. Robert Coupar, writing from Craighall, Perthshire, observes that it has not been as numerous in 1880 as in the previous season. He mentions the Beetle as very destructive to Pines of all ages, from trees newly planted up to those sixty years old, but that the attack is worst, or at least the damage is most serious, to the young woods, rather than to the old matured Pines. The Beetles, when developed from the

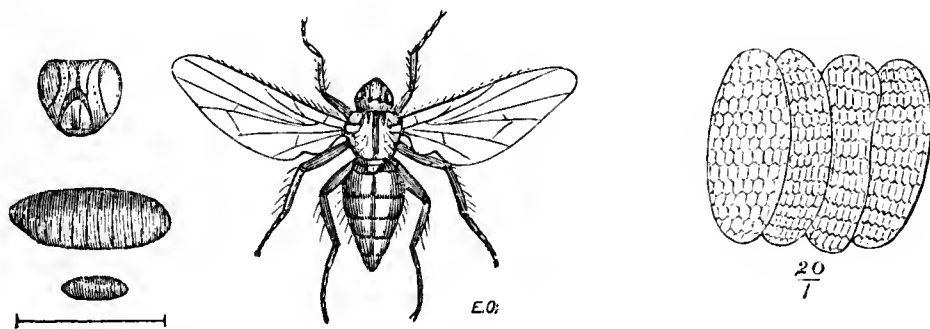


larval galleries bored beneath the bark (of which a figure is given from specimens forwarded by Mr. Coupar), fly to the young shoots,

and bore an entrance-hole either into the shoot of this year's growth or that of the previous year, and gnaw a boring, usually upwards, but sometimes downwards. If upwards, they commonly effect an exit by piercing a little hole at the top; but sometimes they turn and effect their exit an inch or two lower, and it is noted that they at times effect their entrance at the upper part of the year's shoot, and work downwards into that of the previous season. The damage is great, as the injured shoots lose their leaves, or only partially develop them, and a bushy, stumpy growth ensues in the following year at the ends of the attacked branches. The infested trees may be known by this appearance, as well as by the brown colour, in the winter, of the shoots which have been bored up the centre in the previous summer or autumn. Mr. Coupar mentions that he thinks when the time of the Beetles for feeding in the shoots is over that they take to sickly trees, old Scots Pine, or any forest rubbish to lay the eggs of the future brood. He mentions that he has met with the Grub in dead wood at all times, and finds that the eggs are laid in trees of all ages, not only in old wood; he has also taken the Grubs from young Pines of about ten years old, which were lying about dead. The illustration shows the large central gallery pierced beneath the bark by the mother Beetle for oviposition, with the galleries eaten from each side of it by the Grubs, gradually increasing in size as the growing larva gnawed its tunnel correspondingly of convenient size. Mr. Malcolm Dunn mentions that the district of Dalkeith is pretty clear of this Beetle, and considers pinching off the infested shoots and burning them is the best remedy in the case of small trees. Decaying wood or bark is the favourite breeding-place of the Pine Beetle (and troops of other noxious insects), and this should be systematically collected and burned in Pine woods to prevent the increase of insect pests. Mr. Service observes that the *Hylurgus piniperda* was not noticeable this year at Maxwelltown, Dumfries.

Passing on to Injurious Insects not mentioned in the list, the most remarkable appearance of the season was that of the Beet Fly, *Anthomyia betæ*. This is a small ashy grey, two-winged Fly, somewhat less than a quarter of an inch in length, and somewhat under half an inch in the spread of the wings. In the male the abdomen is linear, with a black triangular spot at the base of four of the segments; in the female the abdomen is enlarged immediately behind the thorax, and then tapers rapidly to a blunt point; also there is a dark stripe along the centre, and a fainter one on each side. The eyes nearly touch on the top of the head in the male; in the female they are at some distance apart, and have a band round them, as figured on the front of the face, these bands having a row of minute dark dots along the

centre. The flies are sprinkled with black bristly hairs, and the legs are also bristly. The larva or maggot is about one-third of an inch long, white or tinted with greenish, somewhat pointed at the head, and blunt at the tail; it is legless, and resembles the larva of the Celery-leaf miner. Like it, the maggot of the Beet Fly feeds between the two sides of the leaf, gnawing away the cellular tissue, and thus reducing the part of the leaf attacked to a mere empty blister. Mr. Norgate noted larvæ as abundant in the Mangold leaves at Sparham on the 20th of June. On the 1st of July Mr. Norgate dug round some of the attacked Mangolds, and found the pupæ (to which the larvæ had turned) about three inches below the surface of the ground. "One field of nineteen or twenty acres was considered to be set back about three weeks by the injury to the leafage." From these pupæ, Beet-flies hatched on the 7th and on the 13th of July, and on the 1st of August Mr. Norgate captured many of the flies at rest on the Mangold leaves, and found a large number of eggs on the under surface of the leaves. The larvæ appeared now more numerous than before, and the whole field looked brown with the dry and blistered leaves; and on the 29th of September Mangolds at Sparham are noticed as "fresh blown" by the flies. Mr. Norgate's observations thus show certainly two broods, and probably three, in the course of the season, and also, as he found the pupæ in the earth, and no specimens that he observed turned to the pupal state in the leaf, it points to the class of remedies needed to get rid of them.



ANTHOMYIA BETÆ. Eggs and head, mag. ; pupa, nat. size and mag.

The Beet Fly has not been much observed in previous years, but in the present season injuries to the Mangold crops have been reported as more or less prevalent over the country (from the East to the West of England, and as far north as the neighbourhood of Dumfries, and also in the West of Ireland), which have either certainly been caused by the maggot of this Fly, or may reasonably be attributed to it. Mr. Service mentions dipterous larvæ as mining in the leaves of a field of Mangolds at Slogarie, and doing much damage.

Mr. Fitton, writing from Cheerbrook Nantwich, Cheshire, reports that, in the case of a Grub destroying the leaves of the Mangolds (in its method of working similar to that of the Celery Fly), different

parts of the field were dressed with guano, soot, and mineral superphosphate; all had a good effect, but the superphosphate the best.

Mr. Harley Kough, of Church Stretton, supplied me with specimens reared from larvæ taken in the Mangold leaves, and forwarded still secured in the bottle in which they had undergone their transformations, from one of which the accompanying figure is sketched.

The Mangold leaves showed some amount of attack in a large field near Isleworth, but were not much harmed, and in a large number of leaves which I examined I did not find a single larva had turned to pupa in the leaf.

Dr. R. J. Mahoney, of Dromore Castle, Kenmare, Kerry, notes the attack of a larva of a species he had not noticed in previous seasons on the leaves of the Mangolds, The leaves withered off here and there, but the roots did not suffer.

At Ballinacourte, Tipperary, Mr. Sym Scott notes, on the 25th of August, that the Mangolds were sadly destroyed by *Anthomyia beta*, which he had never before seen. It appeared about the beginning of August, and the injury was at first taken for the effects of frost; the crop suffered much damage.

Phædon (*Gastrophysa*) *polygoni*. Mr. Harley Kough, on the 22nd of June, mentioned that the Mangold crops were severely injured in the neighbourhood of Church Stretton and many parts of Shropshire by a Beetle, which lays myriads of white, long eggs on the under side of the leaves, from which the larvæ soon hatch and feed on the leaves where the eggs have been deposited. The specimens forwarded proved to be *Phædon (Gastrophysa) polygoni*, a small oval Beetle less than a quarter of an inch long, of a blue or greenish colour, with thorax bright shining red, the tip of abdomen and legs also red, the horns black and red at the base. This Beetle is to be found on the common Wild Knot grass, *Polygonum aviculare* (from whence it takes its specific name), also on Dock and Sorrel. It is mentioned by Mr. Kough as not having been previously observed on the crops in the neighbourhood, and the Beetle is noticed as difficult to capture on account of its habit of dropping from the leaves on any disturbance, and burrowing into the ground. The heavy rain did much in clearing the Beetles and larvæ, but the eggs, being on the under side of the leaves, remained still attached.

Ceutorhynchus *sulcicollis*. The Cabbage and Turnip Gall Weevil is noticed by Mr. Sutherland as very prevalent this season near Berridale, Caithness, and he mentions gas-lime and soot, also seaweed and salt, as good applications to prevent attack.

Carpocapsa pomonella. The Codlin Moth (of which the Grub often does much damage by feeding inside the fruit and causing what are known as "worm-eaten" Apples), is noted by the Rev. F. Adams as about this year at Little Faringdon, Lechlade, "a most unusual thing here;" and I can report its unusual absence in my own garden.

A fine specimen, five inches long, of the Caterpillar of the Death's Head Hawk Moth (*Acherontia Atropos*), was found in a Potato field near Forres, Morayshire, and is mentioned by Mr. D. Scott.

Wasps have been extraordinarily plentiful, the visitation apparently reaching its height in the Stewartry of Kirkcudbright, in Scotland, and at Glenarm, Co. Antrim, Ireland. At the first-mentioned place Mr. Service reports an enormous number of ground nests, and that it was dangerous to walk through the copse woods on account of the nests of *V. norvegica* and *V. sylvestris* hanging in every thicket. At Glenarm the nests, both of the ground and tree Wasps, were so numerous that it is noted by Mr. Brunton that it was with difficulty that some of the meadows were worked. Amongst various means for destruction of ground nests, probably there is none so complete in the operation, and so safe for the operator and for surroundings, as simply pouring a little coal-tar down the mouth of the entrance-hole when the Wasps have returned home for the evening. Mr. Boyd mentions this as having been found very serviceable at Callander; and in W. Gloucestershire, where Wasps' nests are plentiful in the neighbourhood of the orchards, it answers very well, with little trouble.

Aphides appear to have been very prevalent in many places. The Carrot Aphis occurred near Dingwall. Aphides generally are mentioned as most destructive at Paltallock, Argyllshire. Cherry-tree Aphis is mentioned by Mr. Simpson as troublesome in Ross-shire, and Mr. Dobson mentions a severe attack on the Hops on the 21st of June, these being subsequently cleared by the Ladybird larvæ by the 5th of July. Mr. Dobson notices the large appearance of Aphides coincidently in date with the *Cicada spumaria*, commonly known as the Cuckoo Spit or Froth Fly insect; and Mr. Long, of Henlow, also notices the great appearance of this insect as being considered a forerunner of that of the Aphides.

Mr. Hart, of Kingsnorth, Kent, notes that Aphides have abounded on almost everything. He noted them on Wheat, Barley, Oats; Beans, Peas, Tares, Lucern, Yellow Vetchling; Cherry, Gooseberry, Raspberry, Apple, Plum; Lettuce, Radish; Oak, Birch, Elder, Guelder Rose, Blackthorn; Hop, Nettle, Thistle, Sow-thistle, Dock, Black Knapweed, Meadow-sweet, Mouse-ear, Hogweed, Reed, Poppy, Purple Loose-strife, May-weed, Fat-hen, Calceolaria, Pelargonium.

This long list is of much interest relatively to the appearance of

any one species on its wild food-plant, and also on the crop which it may infest. Thus we have the species (*Aphis rumicis*) infesting the Beans also noted on its wild food-plants, Docks and Thistles. The Hop Aphis also frequents the Blackthorn and the Plum, and, whilst the absence of the Aphis is noted from the Turnips, there is a corresponding absence of entry of other plants on which, as far as I am aware, this Aphis more especially feeds. Mr. Malcolm Dnnn notes that the Larch Aphis prevailed extensively in almost all parts of the country where the tree is grown.

Syringing with soap-suds is the remedy which appears best known amongst those noted, and is mentioned as being very serviceable.

The observers unite in pressing the importance of the preservation of Birds. The Rook has been seen doing good service in clearing off the Crane-flies; the Lapwing also needs a word to save it, for our benefit, from indiscriminate slaughter; the Starling is a good helper; also the Cuckoo, from its liking for, and capacity for swallowing, the larger larvæ; and, though with regard to the Titmice I am bound to note the comment of an observer with regard to the Blue Tit, "that a more destructive little rip does not exist," yet the family in general, and I am inclined to think this member also, would be greatly missed if not allowed play on the Aphides.

Looking at the results of this year's observations, it will be seen that they point to the importance of such treatment of the soil as may press on a hearty, healthy growth, and to counteracting direct insect attack by special methods of cultivation, based on knowledge of the insect habits, rather than on applications to the insect itself. Thus with Carrot Fly, with which the method of attack is for the Fly to bore down through any cranny and lay its eggs on or close to the root, it will be seen that the advice not to thin when the Carrots are of a size that would open the earth round them in removal,—to avoid a dry time for thinning, and, after thinning to water well with water, or any fluid that is deterrent to the insect,—meets the above point. The watering puts the earth together again, and fills up the crannies, and so excludes attack.

With the Caterpillars of the Gooseberry Sawfly, which pass the winter in the surface soil beneath infested bushes, ready to change to chrysalids in the spring, and come up again as perfect insects with the return of warmth, the most successful method of prevention is to clear off the surface soil with the Caterpillars in it, or so fork, lime, and otherwise treat the few uppermost inches of earth as to destroy the contained pests.

In the case of the *Tipulæ* larvæ, the grubs of the Daddy Longlegs, it will be noticed that the application of guano was successful by affording a temporarily strong supply of food to the plants which were

temporarily (through the gnawing of the grubs), deprived of full power of drawing in food, and consequently were to a certain extent starving.

Special applications and dressings must often be needed to check unexpected attack, and therefore all details of such applications are of service ; but if the general rules of treatment with regard to any of the common insects not yet fully reported on should be laid down by observers as thoroughly as has now been done regarding Carrot and Onion Fly, and Gooseberry Sawfly, we should all benefit greatly.

I would suggest that such information is particularly needed regarding the Cabbage Moth, *M. brassicæ* ; and also that the Pea Weevils and the Celery Fly are insects which need much more attention.

I now wish to offer a few words to the contributors to whom I am indebted for the notes of observation given in this Report. During the autumn I have been favoured with much useful information, contributed partly for the Report, partly for the Manual, which, with this assistance, I am preparing relatively to means of prevention, or of remedy for attack of all our most commonly injurious insects. In the publication of these notes I have followed the wishes of the contributors, as far as I was aware of them, but where I had no directions I have given in this Report such information as referred to the injurious insects on the observer's list, and mainly reserved the other points, as well as in some cases the full detail of the method of operation, for the forthcoming volume.

Amongst these latter observations I may especially mention some on Larch Aphis, and also on Pine Sawfly. It appears to be desirable to mention this, lest I should seem neglectful of the observations with which I feel it a favour to have been entrusted ; and as it is with the assistance of a large proportion of the contributors to this Report that I am forming the Manual, I do not deem it out of place to add, on the cover, a note of the progress of that work.

The promise of contribution of information for the next Report is on a much more extensive scale than has hitherto been the case, and on my part it will be my endeavour to devote thorough attention to whatever may be entrusted to my care. Hitherto I have mainly limited myself, in publication, to mention of the Injurious Insects on the observer's sheet, but in the next Report I purpose to publish all observations that I may be favoured with regarding any kind of our *Injurious* Insects, or matters connected with their prevention, and also to give many more illustrations. Meanwhile I should have pleasure in attending, to the best of my power, to any applications

regarding prevention of the ravages of Injurious Insects. Any application would also be attended to as before by the Rev. T. A. Preston, Marlborough, and E. A. Fitch, Esq., Maldon, Essex.

In consequence of the increasing circulation of the Report, it has been thought desirable to publish in Edinburgh as well as in London. Messrs. Menzies have undertaken the Edinburgh publication, while that in London remains in the hands of Messrs. Sonnenschein and Allen. It will as before be forwarded, immediately on publication, free to all contributors, and as I find, to my regret, that a few copies forwarded last year did not reach their destination properly, I will add a request that should this have happened in any other case the contributor will kindly let me know, that I may forward the Report due.

ELEANOR A. ORMEROD, F.M.S., &c.

DUNSTER LODGE, NEAR ISLEWORTH,

December 22nd, 1880.

In the Press.

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